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THE UNIVERSITY OF TORONTO MEDICAL JOURNAL

(An Undergraduate Publication)

This journal is published seven times a year, November to May, by the Medical Society of the University of Toronto, to serve as a medium for student expression and to bring to the student recent articles of scientific interest.

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Volume VII TORONTO, FEBRUARY, 1930 Number 4

*Physio-Therapy Or Treatment By Physical Agents.

By G. E. RICHARDS, M.B.

Associate in Radiology, University of Toronto.

Physio-Therapy may be defined as that branch of therapeutics in which the active principles are certain physical agents as distinct from chemicals or drugs. The term, therefore, includes within its scope all the varieties, both new and old, of light (photo-therapy); electricity (electro-therapy); various waters and baths (hydro-therapy); massage; remedial gymnastics; and finally, if we are to be consistent, the several varieties of "rays" or radiation therapy such as ultra-violet, X-rays and radium.

Unfortunately several of these have been, in the past, exploited by charlatans outside the profession, or by some within who were over-enthusiastic or unreliable in the claims made of results obtained until it became difficult to convince the conservative members of the profession that this whole branch of therapeutics was not, in fact, beyond the pale, or at best of very doubtful value.

Unfortunate also is the fact that most of the literature now being distributed on this subject is the propaganda of selling organizations, many of whom will sell their apparatus equally readily to a graduate in medicine or to the latest product of the chiropractic college. The comedy of this situation might be passed off as being simply

*Reprint from the University of Toronto Medical Bulletin.

ridiculous until it is realized that with such equipment and a new diploma these men are then free to treat anything from acute lobar pneumonia to infantile paralysis, and that detailed instructions for the treatment of each may be obtained with the delivery of the machine supplemented by a free demonstration by the salesman.

Thus there is a danger that the medical profession may be placed in a position in which it is made to appear that no other form of treatment is used except drugs or medicines, whereas, of course, the truth is that practically all of these methods were developed by members of the medical profession. It should be our aim to ensure that those which possess merit are carefully accepted and freely adopted, while if some of these methods are not of value every physician should be fully aware of the fact and should know the reason why.

The following observations have been prepared by request in an attempt to answer a part at least of this question. Any merit they may possess lies in the fact that they represent personal observations in a large number of cases during the past ten years, and have not been copied for the purpose from any text-book.

In attempting the study of a subject of this kind it will greatly simplify the problem if we resolve into a few fundamental principles, the various agencies to be discussed. When this has been done it will be seen that in several of these we are face to face with old friends whose actions and indications are at once apparent when they have been shorn of their mystery. In a few others we have improved or more convenient means of applying methods of treatment long in use. In a few instances only we are actually dealing with a "new" addition to our general Therapeutic armamentarium.

They fall naturally into certain groups.

I. LIGHT.

In the first group will be considered various applications of *Light*. On first glance this might appear to include only visible light, but in view of our present knowledge it goes much further. It should not be necessary in these days of radio and the general knowledge of wave-lengths to emphasize the fact that visible light is merely a part (and a very small part) of the immensely greater Solar spectrum, and that the only difference between the colour we call red and the colour we call violet is wave-length. These wave-lengths are so short that whereas radio waves may be stated in terms of hundreds of meters in length from crest to crest, when we come down to visible light, the length of the waves must be stated in millionths of a centimetre. A special unit of measurement had to be devised for this purpose, and this, named after its proposer, is called one "Angstrom" and is equal to 1-100,000,-000 of a centimeter. Using this scale visible light ranges from Red-7700 Angstrom units down to Violet 4040 Angstrom units.

This conception of light leads directly to the much greater one of the whole range of radiation or "rays." We appreciate as visible light those waves, or radiations, falling between 7700A and 4040A, because the human retina is sensitive to this wave-length, but extending out from both extremes of these, which we can see, are others which cannot be seen, but have important phsiological properties none-theless. On the one side, just beyond the red end of the spectrum, are the infra-red rays, chiefly sedative in character and producing heat, but having few chemical properties, just as the color red is chemically inactive as compared with violet. On the other end, beyond the violet, are the so-called ultra-violet rays, intensely active chemically, strongly bactericidal and powerfully stimulating to metabolic processes generally. Far beyond these again

come the X-rays, and finally the gamma rays of radium. And, in a general way, it may be said that the only fundamental difference between any of these agents is the difference in wave-length peculiar to each. It is essential to keep this constantly in mind, since it is usual to think of all of these as being radically different agencies, whereas, strictly speaking, the use of any of them as a therapeutic measure is merely the use of differing forms of the same physical agent, i.e. a different form of "radiations."

II. ELECTRICITY.

In the *Second Group* we would consider the various forms of Electricity. From the very first discovery of Electricity means were sought to utilize it in the treatment of disease, and unfortunately from that time down to the present, there have been those who have made impossible claims, some of which rival the claims of the greatest fakes of medical history.

In industry the successful use of electricity has depended entirely upon a thorough understanding of the fundamental laws of electricity and their application, and if it is to be used equally well in medical work, the same course must be followed.

The physiological effects of electricity have now been studied for a sufficient length of time to permit us to set down at least the more important of the effects which may be secured, somewhat as follows:

(1) Electricity causes the contraction of healthy muscle (both smooth and striped) under suitable conditions.
(2) Electricity causes the ionization of solutions both within and without the living cell.
(3) The resistance offered by the body to the passage of certain types of currents results in the production of heat, and this may be produced at any chosen point and to any desired degree.

There are admittedly other functions and applications of electricity, and yet we believe these four sum up the more important effects, and, apart from them, no physiological results occur which have thus far *been demonstrated.*

III. HYDROTHERAPY.

In the *Third Group* we would place Hydrotherapy, i.e., the use of water in all its forms and under a great variety of modifications as applied to the human body.

Here, also, the diverse effects can probably be summed up in a few familiar phrases:

(1) Heat—moist heat—causing peripheral dilation and being generally sedative to the Nervous System.
(2) Cold—causing contraction of the peripheral vessels and tonic in its effect.
(3) Counter-irritation — Combined with either of the preceding and used in the form of the various whirling baths, sprays, douches and aerated baths.

IV. MASSAGE.

The *Fourth Group* includes massage, remedial gymnastics and re-educational exercise, etc.

Here are included a whole series of procedures of too complex a character to be touched upon in a brief paper such as the present.

Group 1.

Ultra-Violet Radiation.

Bearing in mind the place which they occupy in the spectrum we think of these rays merely as vibrations having wave-lengths roughly from 4000A down to 1800A. Normally present in the sunlight, and responsible for much of its chemical effects, they are, however, easily obstructed and filtered out by clouds, smoke, etc. Hence they are chiefly present in the sunlight on high mountains.

Various artificial means are at our disposal for the production of ultra-violet rays, of which the most effective are exposed electric arcs between carbon points or mercury vapor arcs enclosed in fused quartz containers. The latter are, generally, more convenient to use but do not provide the best substitue for sunlight since the range of the rays produced is much shorter than any rays normally present in sunlight. Allowing for this, however, they are of very great value in a variety of ways, and, if combined with a carbon arc and some means of producing the longer waves, an excellent substitute for sunlight may be secured. Such a combination is of peculiar value in this latitude from October until May, when the available sunlight is uncertain and of a degree of intensity little suited to therapeutic requirements.

Physiological Effects of Ultra-Violet Rays.

There are three essential effects of these rays upon the body, a knowledge of which would indicate clearly certain results which might be expected.

These are:

(1) Increase in the calcium content of the blood.
(2) Increase in the inorganic phosphorous content of the blood.
(3) Increase in the platelets.

These effects are more definite and uniform in young children than in adults, but also occur in the latter. In addition other effects have been shown to occur, including an increase in the red blood corpuscles, a rise in the lymphocyte count and in the haemoglobin.

Two types of apparatus are in use:

(1) The air-cooled lamp.
(2) The water-cooled lamp.

The air-cooled type has several trade names ("Alpine Lamp," etc.) as well as other incorrect names (such as Quartz Light), all of which are used to designate an apparatus the output of which is "ultra-violet radiations." This name should, we believe, be generally adopted, but should be strictly distinguished from another very similar misnomer, viz., "violet rays," with which it has nothing whatever in common.

Air-cooled lamps may be either mercury-vapor or carbon-arcs.

They are used in a variety of ways and produce two main types of reaction, viz.:

(1) Local.
(2) General.

Local effects are also produced by the small water-cooled apparatus, and include relief of pain in such conditions as neuralgia, neuritis, sciatica and in certain forms of arthritis.

The *general effects* are of the greatest value and within rather well-defined limits, we believe, are of more importance than has yet been fully realized.

(1) Rickets.

The effects of ultra-violet rays in this disease may be regarded as a specific therapy, and so much has been written that it is unnecessary to take further time here.

(2) Adenopathy.

Simple enlargement of cervical and mediastinal glands in children form a field in which these rays are of the greatest possible value. The typical case is one in which following repeated infections the mediastinal glands are enlarged, causing an irritable, unproductive cough. This in turn is associated with loss of weight and appetite and the clinical picture so familiar to all. There is usually a suspicion at least of an early tuberculous process. Such cases frequently respond in a manner little short of the spectacular, and there need be no hesitation in using this treatment in any such type of case.

(3) Tuberculosis.

Tuberculous adenopathies are benefited by ultra-violet rays, but the results are slow and treatment must be continued patiently. Combined with X-ray treatments good results may be

expected in a high percentage of the cases. The average duration of such treatment will be six months to a year.

Tuberculous peritonitis and cystitis respond well in a fairly uniform manner, and both are suitable types of cases for treatment, combined, of course, with the other usual methods.

Surgical tuberculosis, i.e., of bones and joints, is far too large a subject to discuss here. Many institutions have reported beneficial results and now use this method routinely as an adjunct to surgery and other methods. It is agreed that no artificial source is as beneficial as natural sunlight when this is available.

Tuberculosis of the skin, including Lupus. Since most of the early work on ultra-violet ray therapy was done in this group more information is available and nearly all of this is favorable. Cures may be expected in from 50 per cent. to 75 per cent of the cases treated if the treatment is thoroughly carried out under proper technical conditions.

IV. TETANY.

Most observers agree that the results of ultra-violet ray therapy in tetany are almost as specific as in rickets and certainly are definite enough to justify its use in any such case.

V. SKIN DISEASES.

In skin diseases this method has been of less value in our experience than X-rays though there is no doubt of its value in a somewhat restricted field.

The same may be said of its use in certain chronic pulmonary infections, such as chronic bronchitis, some forms of bronchial asthma, etc.

VI. THE ANAEMIAS.

Normal blood absorbs all rays with wave-lengths below 4500A, and it was therefore hoped that much benefit might be derived from this method in various forms of anaemia.

Our observation is that this is true of most of the simple anaemias. Here it can be shown that there is an increase in the number of red corpuscles with a corresponding improvement in the haemoglobin. The clinical improvement which results is frequently marked and the patients all feel the improvement. There is much experimental work to support this which we have not the time to consider. "Effects include engorgement or congestion of the vessels, accompanied by a rise in the lymphocyte count. The calcium content of the blood is increased, as is also the inorganic phosphorous, while at the same time intestinal organisms are reduced. Two minutes daily irradiation of a baby has been sufficient to double the inorganic phosphorous of its blood in a fortnight."

The increase in organic phosphorous and calcium are both exceedingly valuable and desirable effects which we have been trying for years to accomplish by the administration of drugs. These results are accompanied by others less easy to prove, but it is reasonably certain that the entire metabolism is stimulated and the resisting powers of the body to disease increased. Such changes would naturally be reflected in improvement in a variety of diseases as well as in the anaemias. While benefit is usually quite noticeable in the simple anaemias, however, the graver forms, such as pernicious anaemia and most of the severe secondary anaemias, have not been benefited in a manner which has made any material change in the course of this disease.

Since it is impossible in a short paper to do more than indicate general principles we may conclude this section by stating the opinion that the above include the major conditions in which ultra-violet rays may be counted upon for definite results. So long as it is not regarded as a panacea for all ills, and cases are selected falling within fairly definite limitations, much may be accomplished—beyond that there will be many disappointments and failures.

Infra-Red Rays.

Following the grouping suggested at the beginning we should refer to these rays at this point as being at the other end of the visible spectrum. They also are invisible and their function is to carry heat. It has been shown experimentally that these rays carry or produce heat within the tissues, thus raising the temperature locally. So far as is known that is their sole property. They, therefore, are of value, like diathermy, in any disease or condition for the cure or relief of which heat is known to be of value. In our experience this method of treatment is about on a par with various forms of radiant heat or baking, but not so useful as diathermy. It is of chief value in large areas, such as the chest or trunk, or some irregular portions of the body where diathermy cannot be applied so effectively. There are several small portable types of apparatus which are inexpensive and very useful for this purpose. They operate from any ordinary light socket and may be taken to the bedside and left there. Treatments last from half an hour up and may safely be repeated. The larger lamps cause a moderate fall in blood pressure (probably entirely due to peripheral dilation), and if the patient's pressure is already low this may result in a feeling of depression following treatment. In one case this amounted to a degree of cerebral anaemia characterized by irrationality. Obviously in such cases the treatment should not be repeated.

X-Rays, Radium, Etc.

While these were included at the beginning to complete the classification it is not intended to discuss them further at this time, merely pointing out that they, again, differ from each other and from ultra-violet and visible light merely in being an infinitely short wave-length but otherwise the same physical agent. (Reference, of course, only to gamma rays of Radium.)

Electricity.

Of the various forms of electricity in use at the present time that which is known as Diathermy is probably the most popular.

This is a method of utilizing a high frequency current. The frequency is so high that the passage of this current through the body is not accompanied by pain or any unpleasant sensation. The tissues, however, offer considerable resistance, which results in the production of heat and this may range anywhere from gentle warmth to a degree sufficient to cause coagulation of the tissues, i.e., they are literally cooked. Such a production of heat is accompanied by congestion of the vessels. The heat may be local and confined, e.g., to one joint, or may be general, and in this way the temperature of the whole body may be raised several degrees.

Owing chiefly to the propaganda of manufacturers and a few over-enthusiastic writers, the impression has been spread abroad that diathermy is some wonderful new discovery which may be relied upon to cure anything from a humpback to a wooden leg. The facts are that it is not new and that it is merely another way of applying *heat* It has the great advantage, however, that the heat is easily controlled and can be produced within the tissues almost at any chosen point.

The Indications.—Any disease or injury for the relief or cure of which heat is known to be of value will be benefited by diathermy. A few of these are so outstanding as to deserve special mention.

(1) Gonorrhoeal Epididymitis.

It will probably be admitted that this is a disease which has been difficult to treat in the past, and among the many methods tried have been included both heat and cold. The results of treatment by diathermy are quite as spectacular as the treatment of rickets by ultra-violet rays and occur much more

promptly. This is so true and so uniformly successful as to justify the term "specific." In fact there are few distressing diseases in which it is possible to secure such prompt and satisfactory results, and it undoubtedly is the method of first choice.

The same is true but in a more restricted sense of gonorrhoeal arthritis in the acute and sub-acute stages. In the chronic and late stage, when organic changes have occurred, results are very little better than by other methods. But in the early stages the results are excellent, and should certainly be sufficient to render this the method of choice, combined, of course, with other usual methods—immobilization, etc.

Results so uniform and outstanding suggest a special underlying reason, and this is found in the comparatively low lethal point of the gonococcus when killed by heat. This is said to be less than 50° C. (i.e., about 110-115° F.), and it is easily possible to raise the temperature of the joint or other tissues affected to this temperature and maintain it there as long as necessary. This would seem to account for the effects secured.

(2) High Blood Pressure.

The statement is repeatedly made that diathermy will reduce high blood pressure. It is, of course, true that this effect occurs in a certain number of cases, but it has been our experience that the reduction is not very permanent and by no means uniform. Some years ago we tried out this method in a series of cases, keping careful blood pressure charts before and after the treatments. During these treatments the body temperature is elevated and the patients break out into a profuse sweat—that is to say, there is a rather marked dilation of all the peripheral vessels. We came to the conclusion that any reduction of pressure which occurred was due to this peripheral dilation, and although the actual reduction might be considerable, it did not last more than a few hours, twelve being about the maximum. Apart from the peripheral dilation we doubt if there is any other effect in this respect and, therefore the method is no better than any one of several other methods available for blood pressure reduction.

(3) Pneumonia.

About three years ago Dr. Harry Eaton Stewart published his results in the treatment of pneumonia and has since published a book upon this subject. He states that if lobar pneumonia is treated by diathermy *within the first* 48 *hours* the death-rate will be very materially reduced. Two years ago, with the permission of Prof. Graham, we tried out his method. A machine of ample capacity was placed in the ward and a trained attendant assigned to the duty of carrying out the treatments. The method and technique described by Dr. Stwart were followed carefully, and during the winter each alternate pneumonia patient received this treatment in addition to the usual routine, while the other alternate patients did not receive diathermy. At the end of the period our group of cases had one death more to record than those who had not received diathermy.

The only conclusion we felt justified in drawing from this work was that diathermy did not materially affect the death-rate of lobar pneumonia in the type of case met with in the Public Wards of a General Hospital. The reason is probably found in the fact that the average day of admission of these patients was the *fifth day of the disease.* The patients, therefore, were very seriously ill and some were almost moribund.

A few felt benefit from the treatment in the sense of added comfort, relief of dyspnoea, etc., but in others we concluded that this was more than offset by the inconvenience and consequent fatigue of arranging the electrodes and giving the rather prolonged treatment.

But since Dr. Stewart specifically states that the treatment must be given during the first 48 hours, and since in our case it was not possible to start treatment until the fifth day, we do not feel in a position to make any statement on the merits of the method other than the above. This will have to come from those who have an opportunity of using it in the early stage of the disease.

Neuritis.

We have not been able to verify the claims made for diathermy in the treatment of neuritis, and on theoretical grounds there is little reason to expect much relief from the pain in this disease. Diathermy treatment is almost invariably accompanied by congestion and swelling and to add this to the already swollen nerve sheath is frequently only to increase the pain.

I venture the opinion that the cases treated in which relief has been claimed in neuritis have not been true cases of neuritis, but have been some form of bursitis or more likely myositis.

The latter group, together with *sprains, muscle lacerations* and recent *fractures,* form a group in which some of the best results may be obtained which are possible by any form of therapy.

Take the typical case of a sprained ankle or wrist, even in the presence of a minor fissure fracture. Such cases also include most muscle lacerations such as occur on the football field and in industrial injuries. There is pain, swelling, a haematoma of greater or less extent, and laceration of muscle or ligament.

The success of treatment depends upon its early commencement following the injury. But if it be commenced promptly and given thoroughly once or twice a day the results are exceedingly satisfactory. The pain is frequently relieved at once and disappears often during the treatment or within an hour or less after it is completed. The swelling rapidly subsides and function is restored much sooner than otherwise.

Case Report of a Later Stage.

Patient had his middle finger struck by a baseball with the usual painful swelling of the mid-phalangeal joint. This continued nearly a week without improvement, the treatment consisting of fixation with a splint, hot compresses, fomentations, and the usual lotions, etc. At the end of the week it was no better, and at this time diathermy was started. Half an hour after the first application the pain ceased and did not return. In forty-eight hours the finger was normal in size and very soon after was fully restored to normal function.

The result could have been obtained equally well immediately after the injury, and thus have saved the patient a week of considerable dicomfort. It illustrates a whole group of cases, including many industrial injuries in which the greatest possible benefit may be obtained

There is also a series of fractures in which similar results are possible, and, I believe, but have not had an oportunity to prove the accuracy of this opinion, that we could almost revolutionize the treatment of some types of fracture if diathermy were used immediately. This includes all the minor linear cracks and fractures near joints in which there is no risk of displacing the fragments by the necessary manipulation. The pain is relieved, the swelling goes down rapidly, and the muscles remain soft and active.

The Arthritides.

There is perhaps no problem facing us which offers greater difficulty than the problem of arthritis in its various forms. To group them all together is so inaccurate as to be indefensible, and yet time does not permit any other method of dealing with them in this paper.

If one might attempt a general statement it would be to say that the best results have been seen in cases of sub-acute arthritis or synovitis of the

non-tuberculous group. Gonorrhoeal arthritis has been referred to and the results in suitable cases of this form are not equalled in any other. In the chronic forms with permanent joint changes, such as old osteo-arthritis, little can be accomplished.

In all forms in which benefit is obtained it is chiefly in relief of pain and swelling. In the sub-acute types this is frequently enough to be regarded as a cure. In others again it is merely a palliative application which is justified through the comfort given the patient. If we remember the statement made at the beginning of this section, viz., that, after all, diathermy is merely the most effective method in our possession of applying heat to the interior of a joint, then its usefulness and indications will be fairly evident without further elaboration.

In the deforming types of arthritis, such as arthritis deformans, we have seen no real benefit, nor can I see how it could be expected

Surgical Diathermy.

If one of the electrodes used in diathermy is large and the other a point, or nearly so, then all the heat is generated around the smaller electrode. This heat is intense and rapidly causes coagulation of the tissues, thus providing an excellent means of destroying various types of growths both superficial and within several of the cavities of the body.

To discuss this use of diathermy adequately would require a whole paper in itself, as there are several large books upon the subject. Here again, however, the method is far from new. It has been in use in England for many years, and the famous French surgeon, Doyen, devoted most of one volume of his great system to it, believing at the time he had solved the problem of the cure of cancer.

In skilful hands it is a great boon to certain surgical procedures, but, like every instrument of its kind, its real usefulness depends entirely upon the skill with which it is employed. At the present time its use in the removal of tonsils is having a great boom in certain quarters, and, while it is true that the tonsil can be effectively destroyed by this means, it is also true that it is a decidedly second-best procedure to a well-done surgical removal; that it frequently leaves tags of tonsil tissue which are later very difficult to remove; and finally it is decidedly not devoid of danger, as everyone knows who has seen a few haemorrhages following its use.

Diathermy is experiencing a period of popularity which may react unfavourably upon the profession unless its uses and limitations are more carefully respected. I recently received a very nasty lecture from a patient when I declined to continue diathermy treatments which had been given elsewhere for the replacement of a floating kidney. How any such result could be expected by anyone who understands the agent he is using is too subtle to catch, and the use of this agent in such cases is too close to the methods of the charlatan for the medical profession to countenance.

OTHER FORMS OF ELECTRICITY.

Galvanism.

This is merely the continuous direct current and either the positive or the negative pole may be used as the active electrode.

The galvanic current is transmitted by both nerve and muscle, and is used in making the usual electrical tests of muscular reaction and to determine the integrity of nerve paths.

As a therapeutic agent it has been employed for the administration of so-called "Ionic Medication." By this means solutions are broken up and may be carried into the cells of the body by ionization. Many experiments are possible to prove that this actually does occur. In the treatment of gout a patient was treated with a solution of

lithium. It was possible to demonstrate the presence of lithium in the urine, thus proving that it had been introduced into the patient's body.

A number of other drugs and chemicals can be used in a similar manner, but of these iodine or the iodides are those which have proved to have the chief clinical application. In cases of bursitis and arthritis there is very decided benefit from this method of treatment. It is not an easy method to adapt to office practice and a mistake in the technic may result in a nasty galvanic burn. We feel the procedure should only be used by a thoroughly trained operator.

Galvanism, when interrupted, causes the well-known contraction of muscle, and this fact is made extensive use of in procuring forced contractions or electrical exercises of muscle. A great variety of applications of this principle are possible, depending upon the frequency and the suddenness of the interruptions and how long the contraction is sustained.

Thus we have the following:

(1) Interrupted Galvanism.

Here the contraction is a sudden, short, sharp jerk and, if the current is strong, it may be painful Since few muscles normally contract in this manner it is not frequently used.

(2) Sinusoidal Galvanism.

A true sinusoidal current is one which was designed to imitate the slow contraction of smooth muscle fibre. The intensity of the current slowly rises to a minimum in a positive phase, as slowly dies away to zero, and the whole sequence is then repeated in a negative phase Such a contraction provides for a period of powerful tonic contraction and a period of rest, and is of very great value in forcing the contractions of muscles whose function is diminished, such as occurs after industrial accidents. This is the current which is used to stimulate the contraction of the smooth muscle of the colon in constipation. For this treatment the current is further modified and administered in a form which is known as a surging sinusoidal current. With the electrodes suitably arranged the abdominal muscles undergo a powerful writhing contraction, and there is also a contraction of the muscle of the colon which can be so powerful as to cause a painful intestinal cramp. Such treatments carried out over a period of time undoubtedly assist in restoring the tone of the intestinal muscles as well as those of the abdominal wall with resulting benefit in cases of constipation. But the treatments must be continued over rather long periods, few cases showing much improvement in a short time.

A good deal has been written regarding the use of this type of treatment for the relief of adhesions. As to the real value of such a procedure it is obviously difficult to reach an accurate opinion. In a short series of cases so treated there were several in whom the symptoms disappeared or were greatly diminished, and the patients were convinced they had received benefit, but none were operated upon so that no opportunity has presented itself to prove what has taken place in respect to the adhesions, nor have X-ray studies been of any material help in this particular group.

In summing up one's impressions upon so broad a subject one conclusion seems to stand out sufficiently as to deserve emphasis, viz., in each of the various methods described there are certain fairly definite results to be expected, which are determined by the nature and properties of the agency employed and the biological or chemical response on the part of the body to this agency. If cases are carefully selected for treatment because of these two known factors great benefit may be expected with quite as much uniformity as in any other form of therapy—in some instances with more.

In addition there are certain other borderline groups in which one or other of these factors is absent or unknown and in such cases, while treatment may be quite justifiable, the results will be much less definite.

Beyond these two main groups lie a whole multiplicity of diseases in which there is no possibility whatever of any benefit being derived. To blindly continue the haphazard use of such methods for the "mental effect" or for any other reason, will only tend to bring the method into disrepute, and thereby delay the normal progress of a system of therapeutics having much inherent value and the possibility of considerable further improvement.

Gall Bladder Disease.

By G. W. MILLER, B.A., 3T0.

Prior to the publication of Naunyn's monograph, "Die Klinick der Cholelithiasis," in 1892, disease of the biliary tract was usually considered wth diseases of the liver. This article apparently produced an impetus for research which steadily gained in volume until, at the present time, the published work upon the subject is stupendous. Our knowledge of the physiology, bacteriology, pathology and symptomatology of this interesting problem has been immensely amplified, but a great deal still remains shrouded in theory.

Gross Anatomy and Physiology.

In order to understand more readily disease of the biliary tract, we must look upon the bile passages as merely a duct system for the conveyance of the bile from the liver to the duodenum. The bile is collected from the liver by an intricate system of intrahepatic bile capillaries which unite to form bile ducts. The latter unite to form the right and the left hepatic ducts which leave the liver at the transverse fissure and unite to form the common hepatic duct. The gall bladder is a distensible pouch which lies in a fossa on the under surface of the right lobe of the liver and communicates with the common hepatic duct through the cystic duct. The latter, with the hepatic duct, forms the common bile duct which empties into the descending portion of the duodenum. The gall-bladder is simply a way-station for the concentration and storage of bile. It acts similarly to a safety pressure valve; the flow of bile being regulated by the tonicity and peristalsis of the duodenum.

Pathology and Bacteriology.

It was formerly believed that B. Coli and B. Typhosus were the chief factors in the causation of gall bladder disease. Work by Rosenow[1] and later substantiated by Brown[2], tends to show that the most common etiological factor in cholecystitis is a strain of streptococci. A. L. Wilkie[3] has recently carried this work a step further and has shown that cholecystitis is almost invariably an intramural streptococcal infection. He showed, by injecting into a rabbit's ear a suspension of streptococci obtained from a human gall bladder, that the animal developed a chronic progressive cholecystitis. This occurred in at least 85 per cent. of the cases and irregardless of whether the cystic duct was ligated or not. He concludes that the organism reaches the gall bladder by the systemic blood stream and causes an intramural infection. The bile inhibits the growth of these organisms and was found to be sterile in the majority of instances. The organisms may be absorbed from the gall bladder wall by the lymphatics and therefore this organ may be a very important nidus of focal infection. Wilkie also states that he believes cholecy-

stitis to precede stone formation in all cases except those in which the solitary chalesterol stone is present. Staphylocōcci and pneumococci are responsible in a very few cases.

Incidence.

Most writers agree that gall bladder disease is at least three times as common among females as males. Mentzer[4] working at the Mayo Clinic, found in a series of 612 successive autopsies on persons over 21 years of age, that 66 per cent. had gall bladder disease and 22 per cent. of these had stones. Gross[5] of Leeds, in a series of 9,531 consecutive autopsies, reports 8.4 per cent. as having gall stones. His statistics also show that gall bladder disease is more common in obese people. The age incidence shows a steady and sustained increase between thirty and seventy years of age. Gall stones disease is also more common among the Latin and Hebrew races than among Americans.

Factors in the Causation of Gall Bladder Disease.

(1) Bile stasis associated with sedentry habits of life.

(2) A disordered cholesterol metabolism. Osler quotes Naunyn as stating that 90 per cent. of women having gall stones have borne children. This is probably an over-estimation; but that pregnancy and gall bladder disease (especially cholelithiasis) are closely associated has long been known. A thorough explanation of this fact has never been given, but it is significant that a hyper-cholesterolaemia and biliary stasis accompanies pregnancy in a great many instances.

(3) Infection. That infection of some form or other plays the major part in the causation of biliary tract disease is the concensus of opinion at the present time.

Mode of Infection.

(a) Ascending infection—That bacteria, by retrograde flow from the intestine, may reach the gall bladder through the common and cystic ducts, is possible, but not probable.

(b) Portal system—Bacteria carried from the various foci of infection in the intestine may reach the liver via portal stream, and not being completely destroyed, pass into the gall bladder with the bile.

(c) Lymphatic spread—Due to the free interlymphatic drainage which exists between the liver and gall bladder, bacteria are able to pass from the liver by this means. Also, it is possible for bacteria to enter the lymphatics of the duodenum at the site of an ulcer and pass up along the common bile duct and cystic duct to reach the gall bladder.

(d) Direct spread—contiguous inflamed organs are a possible means of spread, e.g., when an acute appendix is in contact with the gall bladder, or with the duodenum the site of a perforated ulcer. The gall bladder is frequently found to be diseased and adherent to the duodenum at the site of a non-perforated ulcer.

(e) Systemic spread—The monumental work of Rosenow on haematogeneous infection and elective localization of bacteria has now been repeated by other workers and the concensus of opinion seems to favour this idea. C. H. Mayo[6] in a summary states that "undoubtedly the haematogeneous route is the common one."

Symptomatology of Gall Bladder Disease And Its Complications.

The character and severity of the symptoms in a given case varies with the intensity of the inflammation, the production or non-production of stones, the degree of envolvment of other abdominal organs and the nervous constitution of the patient. Most of the symptoms in typical cases can be explained on the basis of pathological physiology. In the following discussion we will attempt to correlate the clinical findings with the surgical pathology as demonstrated by the X-ray,

operation and post mortem examination

(1) Chronic Cholecystitis.

This condition is due to the lodgment of bacteria in the wall of the gall bladder. It may be chronic from the onset or may be the result of exacerbations of the infection. The so-called "infective stone" is believed to be the result of inflammation. It is also believed that a stone predisposes to inflammation and so a vicious circle may be said to exist. This factor may help to explain why so many gall stones have a cholesterol nucleus and then successive layers of calcium and cholesterol.

To Lord Moynihan[7] must be given the credit of first pointing out the gradual onset of the disease. These patients, if encountered early, give symptoms of a gastro-intestinal disturbance. They complain of little or no actual pain at first; only general discomfort in the upper abdomen, a tendency to flatulency coming on during the meal or immediately afterwards. There is a feeling of constriction and oppression in the epigastrium due to gaseous distension. This is relieved by belching. There may be nausea and occasionally vomiting. Greasy foods tend to elicit these symptoms more readily. The periodicity and definite relation of these symptoms to the taking of food so characteristic of peptic ulcer does not occur, as a rule. Heart burn, anorexia, bilious attacks, sour regurgitations are variable symptoms. As time goes on, the picture becomes a little more definite. The attacks of "indigestion" become more frequent and more pronounced. An aching, gnawing pain in the epigastrium may accompany the gastric symptoms. They also complain of an aching pain under the right costal margin and in the right scapula area. These areas are often painful on deep palpation.

(2) Acute Cholecystitis.

Acute Cholecystitis is an acute inflammation of the gall bladder due to bacterial invasion with or without the presence of stones. In Graham's[8] series of 848 cases of gall bladder disease only 6.7 per cent. were acute. The patient may or may not give a history of gastric disturbances, depending upon whether the condition is an exacerbation of a chronic cholecystitis or a primary acute infection.

Severe paroxysmal pain is usually the first indication of trouble. It may come on at any time and is usually in the right hypochondrium, but may be in the epigastrium. It frequently radiates to the right scapular region and occasionally to the left. It is usually less agonizing than biliary colic, and gradually falls off in intensity. A valuable diagnostic test is to have the patient sit up in bed or stand, then, with the tips of the fingers, press gently under the right costal margin and have the patient take a deep breath. Near the end of inspiration the patient will wince or catch his breath and one is able to localize the trouble. There is also marked abdominal rigidity and superficial tenderness. The liver is occasionally slightly enlarged and tender. Nausea and vomiting, fever of about 101 degrees and some increase in the pulse rate are other features. A moderate leukocytosis is present. A slight degree of jaundice is often associated and is likely due to reflex spasm of the common duct. The acute symptoms gradually subside and the picture becomes one of chronic cholecystitis.

(3) Cholelithiasis.

The exact pathogenesis of gall stones is admittedly not known, but, as mentioned above, infection is likely the precursor of the septic or mixed stone which is present in over 90 per cent. of cases. Whether it is a factor in the formation of the pure cholesterol or pure pigment stones is not yet known.

With regard to the symptomatology of gall stones it is of interest to note the figures of Gross.[5] He states that in a series of 9,531 consecutive autopsies, gall stones were present in 8.4 per cent.,

and of these 71.8 per cent. were casual findings. This high figure indicates how frequently this disease is latent and unobstrusive. However, had a careful history been taken, it is likely that this figure would have been lower. Of recent years more and more patients are being subjected to operation when they present symptoms which are now regarded as characteristic of gall stones. A few years ago they would likely have been diagnosed as "chronic dyspeptics" or "gastric neurasthenics." Robson[9] was one of the first to point out that the presence of biliary colic and jaundice were not true symptoms of gall stones, but rather of their complications.

A differential diagnosis between chronic cholecystitis and uncomplicated gall stones is often impossible owing to the similarity of symptoms. The typical patient with gall stones is the fat married woman of middle age, the mother of a large family and who gives a long history of minor digestive upsets. Her history may date from a certain pregnancy or from the time of an acute infectious disease such as typhoid fever. More often she is unable to give the time of onset of the symptoms. The history often dates back as far as fifteen to twenty years The symptoms have been fairly constant with no periodicity She complains of a dull aching or gnawing over the epigastrium or gall bladder region, which comes on during or immediately after meals. This is accompanied by a feeling of fulness and distension and is relieved by eructations of gas. Occasionally one may elicit slight tenderness in the epigastrium and right hypochondrium. A few writers lay stress on the presence of a spastic sigmoid colon as a diagnostic sign of gall stones. Watson[10] points out that these symptoms are rarely severe and for years the patient may use only home-remedies which give some temporary relief. However, the condition is progressive and sooner or later dangerous complications will arise.

Complications of Gall Stones:

McKenty[11] has recently reported his findings in a series of 225 cases of cholelithiasis. He states that serious complications occurred in 45.3 per cent. In the John Hopkins' cases, the incidence ran over 50 per cent. These figures would indicate the seriousness of the condition.

(1) Biliary Colic.

This complication is usually due to the impaction of a stone into the neck of the gall bladder, or into the cystic or common duct with a resultant spasm of the gall bladder. Magner[12] points out that a severe attack of colic in a patient who has never had any dyspepsia or symptoms of colic, is suggestive of a single stone, probably of the pure cholesterol type. However, biliary colic is sometimes encountered in the absence of stones and is due to spasm and acute inflammation of the gall bladder. Gall stones may pass through the biliary tract or may even become lodged there without producing pain or severe symptoms This is not common The attack usually starts abruptly and often at night This may be explained by the fact that the gall bladder is distended at night, allowing the stones to escape more easily into the duct. The pain is severe at first and soon becomes agonizing. It is usually paroxysmal in type and begins in the right hypochondrium or in the epigastrium and radiates to the right shoulder It may radiate to the left shoulder, umbilicus to the opposite side or even down the legs. The pain is usually so severe that the patient rolls about in agony. Reflex vomiting, feeble and rapid pulse rate, shivering and often rigors are signs of biliary colic. Sixty per cent. of these patients have a fever which averages about 101° and is likely due to the associated cholecystitis. On examination, the abdominal muscles are rigid. The liver is tender and enlarged in about 15 per cent. of cases. On palpation, with the patient in the sitting position,

the gall bladder region is usually found to be quite tender. The duration of the attack is variable. It may persist from a few minutes to several hours. It usually ends as abruptly as it started, due to the fact that the stone has either passed on into the intestine or dropped back into the gall bladder. Biliary colic tends to recur at irregular intervals. Deep jaundice occurs if the stone becomes lodged in the common duct. It must be stressed, however, that jaundice is not necessarily an accompanying symptom of all cases of biliary colic.

(2) Acute Cholecystitis.

This condition has been discussed above. A very few cases of gall bladder disease go on to gangrene and suppuration (empyema) of the gall bladder. In these cases the difference in the symptoms is one of degree rather than of kind.

(3) Obstruction.

(a) In the cystic duct.—The patient usually gives a history of an attack of typical biliary colic which lasted for a variable length of time, gradually disappeared, and was or was not associated with a transitory jaundice. Depending upon the degree of inflammation in the gall bladder, one of three things may happen.

(i.) Acute empyema of the gall bladder with the associated symptoms of acute cholecystitis.

(ii.) A mucocoele of the gall bladder which is readily palpable on examination.

(iii.) Atrophy of the gall bladder.

(b) In the common duct—As the cystic duct dilates and the stone passes into the common duct, a deep jaundice follows the characteristic colic. During this time the stools will be clay coloured and the urine darkly pigmented. These signs clear up gradually, following the passage of the stone into the duodenum. Physical examination reveals an enlarged gall bladder only in those cases where there have been no previous inflammatory processes. If the stone remains in the common duct there will be a cholangectasis. If infection is superimposed there will be a cholangitis which usually ends fatally.

(4) Carcinoma of Bile Ducts.

Malignancy is not an infrequent complication of gall bladder disease and is associated with gall stones in about 75 per cent. of cases.

(5) Less Common Complications Are:.

(a) Intestinal obstruction which is due to the penetration of a large gall stone through the gall bladder wall into the intestine. A number of cases have been reported in the literature.

(b) Biliary fistulae.

(c) Perforation of the bile passages.

DIAGNOSIS.

Twenty years ago it was said that a correct diagnosis of gall bladder disease could be made in 90 per cent. of cases upon a carefully taken history. This remains true to-day. There is no other condition in which a careful history is so important to reach a correct diagnosis. A number of laboratory tests have been devised to assist in the diagnosis, but so far, little of practical value has been ascertained from them. In a few cases it may be necessary to do a laparotomy to finally reach a decision. The introduction by Graham[13] of a satisfactory method of taking cholecystograms constitutes a tremendous advance in the diagnosis of disease of the gall bladder. Graham uses the intravenous injection of the sodium salt of tetraiodophenolphthalein, a salt which is excreted entirely by the liver and is opaque to the X-ray. At the present time, the oral administration of the salt appears to give equally good results. Furthermore, this method is safer and more practical. The general technique is as follows. At 7 p.m. the patient takes a heavy meal of bread vegetables without butter; a salad which is free of oil, and fruit or jam and water to drink. One hour later he takes the power mixed thoroughly

in ¼ glass of grape juice and retires immediately. The next morning, abstaining from breakfast or even the smell of food, he reports at 9 a.m. for an X-ray. At this time four plates are taken in succession. He immediately goes out and eats a meal containing excess fat and returns at 2 p.m., when four more plates are taken. By paying careful attention to the bowel shadow and to the condition of the gall bladder, the function of the latter can be determined and a diagnosis made. These diagnoses have been checked up at operation and records at the Toronto General Hospital show the X-ray diagnosis to be correct in 89 per cent. of cases. The chief value of cholecystography lies in its aid in the diagnosis of doubtful cases.

Differential Diagnosis.

1. Peptic Ulcer.

The distress of cholecystitis is not relieved by the taking of food and the attacks are constant, the patient being free of distress for only a few days at a time. Peptic ulcer shows a periodicity in its nature and is usually relieved by the taking of alkalies.

2. Acute Appendicitis.

If the appendix were always in its proper position there would be little difficulty, but owing to its freedom of movement it is often found pointing up behind the caecum and ascending colon. If it becomes inflamed in this position, the symptoms will closely simulate those of gall bladder disease. Deaver and others report a high incidence of relationship between disease of the gall bladder and appendicitis. The history, rectal examination, leukocyte count and the presence of tenderness in the groin may assist in the diagnosis

3. Carcinoma of Head of Pancreas.

This condition calls for a differential diagnosis only when it may become confused with a stone in the common duct. Cancer of head of pancreas is not an uncommon condition, and is seen more frequently in males. It is painless at first, but later, owing to an associated pancreatitis, it may cause pain similar to that seen in biliary colic. The jaundice associated with cancer of pancreas comes on fairly slowly, becomes intense and remains constant. The jaundice following the impaction of a stone in the common duct comes on more quickly, becomes intense and then fluctuates owing to the ball valve action of the stone. Courvoisier's Law states that in cases of common duct obstruction, distension of the gall bladder is significant of pressure upon the duct or disease of the duct rather than gallstones.

4. Renal Colic.

The radiation of the pain, the presence of bladder symptoms and an X-ray examination will assist in the diagnosis.

5. Cardiac conditions.

It is most important to be able to rule out Angina Pectoris and Coronary Thrombosis. A careful history, physical and electrocardiographic examinations are indicated.

6. Upper abdominal conditions.
   (a) Perforated peptic ulcer.
   (b) Acute pancreatitis.
   (c) Thrombosis of mesenteric vessels..
   (d) Diaphragmatic hernia.
   (e) Tabetic crisis.

These conditions are not uncommon and must be differentiated from biliary colic

7. Pneumonia and Pleurisy.

Mistakes in this respect may be avoided by making it a rule to examine the chest thoroughly in every case of acute abdominal disturbance.

8. Acute intestinal obstruction.

This condition may occasionally simulate biliary colic especially if the obstruction is of the high intestinal type.

9. Spondylitis.

It must be borne in mind that spondylitis is often unilateral, otherwise confusion is not likely to occur.

In conclusion, it must not be forgotten that the gall bladder is an import-

ant focus of infection and requires careful investigation in cases of chronic joint conditions, just as do the teeth, tonsils, sinuses, etc. In many cases in which the gall bladder has been proven to be pathological, its removal has resulted in marked improvement, if not cure of the arthritic condition. A careful history of this type of case will frequently elicit the indefinite dyspepsia associated with a chronic cholecystitis.

Prognosis.

Cholecystitis is a chronic low grade infection which is progressive in nature and which if untreated tends to result in stone formation and other complications. For this reason the outlook is always uncertain. The upper abdominal triad of gall bladder, liver and pancreas is often found to be the seat of a chronic infection following cases of long standing biliary disease. This would account for the failure in not a few cases, to get relief from symptoms, following a cholecystectomy. It also shows the value of an early diagnosis before the development of hepatitis and pancreatitis. Furthermore, in a certain number of cases of Diabetes Mellitus, there has been associated disease of the gall bladder.

Treatment.

The treatment of gall bladder disease falls naturally into three divisions:

1. Prophylaxis.

Treatment is here directed against the factors which are known to assist in the causation of the disease. Ryerson[15] advocates plenty of exercise, which stimulates deep breathing in an effort to overcome biliary stasis. Rolleston[16] advocates frequent small meals which would also tend to prevent stagnation of the bile. Hurst[17] prefers giving magnesium sulphate in concentrated solution one hour before breakfast in just sufficient quantity to get the bowels satisfactorily opened without the use of any other aperient. Magnesium sulphate has long been known as a cholagogue, and the oral administration is an advance over the old method of passing a duodenal tube. To prevent a hypercholesterolaemia one would reduce to a minumum the fatty constituents of a patient's diet; this is particularly applicable to women during pregnancy. It is strongly advised that focal infections such as oral sepsis, tonsilitis, sinusitis, etc., be removed in order to prevent the localization of the disease in the gall bladder.

2. Medical Treatment.

Followers of Rosenow advocate the use of streptococcal vaccines, but so far little success has attended their efforts. It is the consensus of present day opinion that medical treatment is only palliative since it cannot effect a cure.

3. Surgical Treatment.

The feelings of the majority of surgeons on this matter has been adequately put forth by Burden.[18] He says in part, " the serious consequences of disease of the gall bladder far exceed its functional importance, so that even when slightly diseased, operation is justifiable when the symptoms have reached the stage of pain and distress." The choice of an operation lies between removal or drainage. After much debate and controversy, the verdict has finally been given in favour of the removal of the organ, wherever possible. As mentioned before in this paper, a stone may reach the common duct without giving any sypmptoms, and failure to realize this has resulted in removal of the gall bladder without a search for hidden stones. Recurrence of trouble after cholecystectomy is undoubtedly due in many cases, not to a new stone but to one which was overlooked at the time of operation. The conservative operation of drainage is at present reserved (a) for the very acute cases where radical surgery presents unjustifiable risk, and (b) in the obese subject on whom a cholecystectomy would be unusually difficult. In very long standing cases with associated pancreatitis and hepatitis, a T-tube

has been used to drain the common duct with the intention of relieving the strain on the liver and so limiting the infection. In all other cases cholecystectomy appears to be the operation of choice.

BIBLIOGRAPHY.

1. Rosenow, E. C., Jour. Inf. Diseases, 19, 527, 1916.
2. Brown, O., Achives of Int. Med., 23, 185, 1919.
3. Wilkie, A. L., see Wikie, D.P.D. Brit. Med. Jour., 1, 481, 1928.
4. Mentzer, S. H., Surg. Gyn. and Obs., 42, 782, 1926.
5. Gross, D. M. B., Jour. Path. and Bact., 32, 503, 1929.
6. Mayo, C. H., Annals of Surg., 84, 358, 1926.
7. Moynihan, Sir B., Abdominal Operations. W. B. Saunders Co., 1926.
8. Graham, E. A.; Cole, W. H.; Copher, G H.; Moore, S., Diseases of the Gall Bladder and Bile Ducts. Lea and Febiger, 1928.
9. Robson, Sir Mayo; Diseases of the Gall Bladder and Bile Ducts. London, Bailliere, Tindall & Cox, 1904.
10. Walton, A. J., The Surgical Dyspepsias, McAinish & Co., 1923.
11. McKenty, J., C.M.A.J., 22, 11, 1930.
12. Magner, W., C.M.A.J., 18, 155, 1928.
13. Graham, Evarts A., Brit. Med. Jour., 2, 671, 1926.
14. Deaver, J. B., C.M.A.J., 18, 666, 1928.
15. Ryerson, E. S., C.M.A.J., 20, 152, 1929.
16. Rolleston, Sir H., Int. Clin., Vol. IV., 108, 1922.
17. Hurst, A. F., Lancet, 1, 966, 1926.
18. Burden, V. G., Am. Jour. Surg., ', 556, 1927.

Dermatology In Its Relation to Medicine.

By E. J. TROW, M.B.

Assistant Professor of Medicine in Charge of Dermatology.

A study of the skin and the readily accessible mucous membranes should almost be an introduction to clinical medicine as it is reasonable to assume that a disease which can be visually followed in its variations should, and does, convey more meaning than one not so visible.

The skin is constantly exposed to the irritating effects of many substances for, as Ormsby, in his text book, states, "the skin may be regarded as one vast area of sensitive nerve terminals," therefore it influences to a large extent the reaction of various organs of the body to external influences; these influences are heat, cold, light and trauma.

Cramer shows in his experiments on the thyroid-adrenal sympathetic system that this system's chief function is that of heat regulation. Cold seems to be the chief stimulus to this system and brings forth adrenalin and thyroxin in the crowded capillaries of these glands, thereby constricting the peripheral circulation and restricting heat loss. Under the influence of cold, liver function is increased, more glucose is poured into the circulation and the metabolic rate raised accordingly. The favourable influence of changes in temperature has a good deal to do with our well-being and changes from warm to cold are stimulating, conducive to work and increased energy in normal individuals. In contrast to this is the enervating effect of the moist heat of the tropics where no such stimulation occurs to the thyroid-adrenalin sympathetic system.

Certain individuals belonging to a group where the skin is dry and ichthyotic are almost always affected in colder climates largely because of their

inability to respond to this stimulation. They are a type thin, shivering, hypotonic, frequently asthmatic and their skin, even in early infancy, inclined to be eczematous in the colder weather. From this group of patients many of our skin conditions are drawn; first, because of the congenital abnormality of the skin making it susceptible to external influences such as irritations in industry, and secondly, an underlying lack of muscular and general body tone producing abnormal excretions which may act as toxins.

A second state more important and more frequently seen than the ichthyotic one is commonly called the seborrhoeal state. This seborrhoeal state may be divided clinically into two types. 1. A simple type to which certain flushed, aggressive, robust individuals belong who later in life become plethoric and are usually of fair complexion. 2. A toxic type whose skin manifestations may be most varied. This toxic group show a skin muddy in dark complexioned people, pigmented, greasy, and a tendency to pus infection in the form of acne pustules, boils, etc.

The point I wish to make clear is that though the skin changes are varied and extensive, internal changes just as marked are noted. The mucous membranes present a scum on the lips, a gingivitis, a red tongue with raised papillae and the teeth show caries. The change in the gastro-intestinal system shows as flatulence and in the toxic type more or less marked constipation with a urine nearly always highly acid. The significance of these external and internal signs is that they are the result of faulty metabolism and are of importance in general diseases in estimating resistence. It is certain that most of the signs and symptoms of this seborrhoeal state point to an altered fat metabolism, and as this produces a lowered resistence to infection on the skin, may it not be true that this faulty metabolism may be responsible for internal infections as well.

The skin, in the face of this seborrhoeal state, is most apt to show infection with three organisms: 1. Bacillus acnes; 2. Staphylococcus Albus; 3. The bottle bacillus of Unna. These produce certain diseases which are well known, easily recognized and treated with more or less success even though that underlying state has not been changed. These three organisms nearly always are found on the skin in its normal state; but on a normal skin seem to occur, as Sabouraud maintains, not actively growing, but as isolated units. This same investigator maintains that when these organisms are found actively growing on the skin definite disease is present; that their growth is favoured by errors of metabolism and hence faulty secretion of the sebaceous and sweat glands is undoubted.

The character of the tissues composing the skin is essentially protective and as to the important part played by it in body defence there is no doubt. This defence is not only local, but many investigators maintain that immunity and protective bodies are formed in skin, aiding thereby general resistence.

Infections of a general character produce skin manifestations and the opinion is held by many that these skin lesions represent a part of the body's fight against infections. The skin lesions are the outcome of an attempt to destroy infection locally. In the case of the infectious fevers, recovery from that infection may be dependent on the rash and an immunity is built up in the skin acting as a protection for the future.

I believe there is a good deal of evidence to show that certain skin lesions alternate with certain visceral lesions and in infections such as tuberculosis and syphilis this is particularly true. It has long been noticed that patients who suffer from skin tuberculosis and tuberculides are almost immune to internal tuberculous lesions, but when advanced tuberculosis of the internal

organs does occur the skin lesions disappear and moreover the positive skin test of Pirquet often disappears with them. This phenomenon demonstrates a cutaneous allergy and adds to the suggestion that the skin more than any tissue is best suited for the attenuation of tubercule bacilli.

In syphilis following an incubation of about three weeks a chancre develops as a local lesion swarming with spirochaeta which soon cause swelling of the lymph glands and lymphatics, the virus in this way reaching the circulation. Another incubation period occurs, then the secondary eruptions develop; the Wassermann reaction becomes very strong and while at first the eruption is very general in character, it gradually becomes less extensive although the individual lesions are larger in size. This goes on until the lesions disappear and the Wassermann becomes weaker, then a period of latency may be followed by a tertiary period when large gummatous lesions may appear on the skin. It would seem, then, that during these incubation periods a state of allergy toward the infecting virus is developing and various tissues are sensitized to the invading organism. In the treatment of early secondary syphilis badly treated cases in which very short inadequate types of treatment are used with long intervals of rest, causing only the superficial lesions to disappear one may feel that the treatment has been successful. If soon after this serious nervous or visceral lesions occur, which is often the case, may we not have interfered with certain natural immune developments and have driven in the eruption, as it were. In syphilis it is almost a rule that cases of tabes or paresis know little of the earlier stages of their infection; and again does not this suggest that they lacked the protective substance which might develop from a well-organized rash. In attempting treatment, therefore, one must not be content to cause a disappearance of a few superficial lesions, but one should aim at complete elimination of infection if that is possible.

Another group of diseases or rather symptoms of disease definitely toxic in nature associated with one or more idiosyncrasies may be noted. In this group one might include urticaria, infantile eczema, certain forms of pruritis, etc., but in this group, too, signs of internal disease are very apparent as evidenced by the frequency one finds hay fever, asthma and certain forms of diarrhoea and occasional migraine. That this group inherits tissues which develop hypersensitiveness to various substances not necessarily proteins, and on contact with these substances react in a striking manner is frequently noted. Most persons are sensitive to antigens or irritants, some who inherit a pecular type of constitution are sensitive to many antigens, yet most of our cases are only sensitive to one or two antigens. It is likely that we are all sensitizible either to a plant, a drug, a protein or other foreign substance, and Block's experiment explains clearly at least how external irritants react. In this experiment he prepared a concentrated extract of Primula Abconica and painted with it a small area of skin of normal persons; in every case he succeeded in producing sensitization of the whole skin, so that subsequent contact with the plant was followed by an acute eczematous dermatitis.

This experiment is important because it shows in a simple way that what we usually described as a hypersensitiveness is really a typical allergy, i.e., by concentrating the antigen a primary point or focus led to a general sensitization of the skin.

In the above few lines I have endeavoured to show the importance of the skin in relation to disease and the probable important part it plays in immunity. An appreciation of the striking changes and wide variety of reactions of the skin to infection, irritation or both. The same infection in an individual may produce a great many types

of lesion, these so varied that one might think they are due to different infections. Finally that skin lesions are so frequently only manifestations of a general state and may ear-mark that state and a study of these skin lesions may bring about a clearer conception of internal diseases.

Acute Intestinal Obstruction: Clinical Features and Treatment.

By H. PAIKIN, 3T0.

Acute intestinal obstruction is an emergency of surgical practice, and one that has until lately, been attended by a very high mortality. This disease has provided a fertile field for experimental study, and of recent years, investigations have brought to light many interesting features which have proved of value in diagnosis, and have laid the foundation for a rational basis of therapy.

Physiological Considerations.

Before discussing the clincial aspects of acute intestinal obstruction, brief reference will be made to certain salient features of intestinal physiology which have a direct bearing on this condition.

The small intestine is concerned with the functions of digestion and absorption, the large intestine chiefly with that of dehydration of the intestinal contents. It has been pointed out by Rowntree that the amount of fluid excreted into the small intestine daily is from seven to ten litres, or from two to three times the quantity ordinarily ingested by mouth, or about twice as much as the total volume of blood in the body. As the intestinal contents pass downward, the fluid undergoes reabsorption, so that the amount remaining in the faeces rarely exceeds 200 c.c. each day. It is evident, therefore, that in the event of any mechanical obstruction to the onward passage of the fluid contents of the small intestine, the patient will suffer dehydration.

Normally, three types of movement are exhibited in the intestinal tract: (1) a segmental or mixing movement, which serves to mix the food and to bring it into more intimate contact with the intestinal mucosa; (2) peristalsis, a rhythmic progressive wave, whose function is to propel the intestinal contents onward; (3) peristaltic rush, a rapid, co-ordinated contraction, by means of which the intestinal contents are moved quickly over a considerable distance. Contraction of the intestinal musculature can result from nervous impulses originating either in the plexuses of Auerbach and Meissner, or in the sympathetic and parasympathetic nerves. The sympathetics act as inhibitors to the gut, the parasympathetics as activators. Stimulation of the former produces slowing of intestinal movement and relaxation of the gut wall; stimulation of the latter results in tonic contraction of the smooth muscle of the intestine.

It has been shown experimentally that the chloride content of the blood bears a direct relationship to intestinal motility. A fall in chlorides below 400 mgm. per 100 c.c. of blood results in a cessation of peristalsis, whereas, on the other hand, the administration of hypertonic saline intravenously produces a marked increase in peristaltic action.

Causes of Acute Intestinal Obstruction.

The commonest causes of acute intestinal obstruction are strangulated hernia, intussusception, carcinoma of the large bowel and peritoneal bands and adhesions. These four constitute 85 per cent. of the cases, and among them strangulated hernia easily ranks

first. Cope cites a consecutive series of 301 cases of intestinal obstruction, of which 177 were due to strangulated hernia, and 124 to all other causes, while Short quotes a series of 277 cases, among which 140 were the result of strangulated hernia. Volvulus, obstruction by foreign bodies, fibrous stricture of the intestine, mechanical pressure upon the bowel from without, congenital occlusion of the gut, and other rare causes, comprise only about 15 per cent. of the cases.

To make an exact diagnosis of the cause of the obstruction in a particular case is frequently neither possible nor absolutely essential. However, one should at least make every attempt to do so. The age of the patient is often of distinct help in ascertaining the nature of the causative lesion. In an infant only a few days old, a congenital malformation, such as an imperforate anus, or congenital occlusion of the rectum, is usually responsible for the condition. In a child from the age of four months to two years, one should think first of intussusception. From the age of four to the age of forty, strangulated hernia becomes the most outstanding cause of acute intestinal obstruction, though during this period of childhood, adolescence, and early middle life, peritoneal bands and adhesions acquired as the result of a previous operation, become very important causative agents. Finally, in the last three decades of life, carcinoma of the large bowel, anywhere from caecum to rectum, assumes the most prominent role.

Clinical Features.

Whatever the cause, the clinical picture is more or less the same in all cases of acute intestinal obstruction. There are four cardinal symptoms, namely, pain, vomiting, constipation, and shock.

The pain is severe from the onset, and characteristically spasmodic or paroxysmal. It comes on in intermittent bouts of colic, excruciating in their intensity, referred most frequently to the epigastric and umbilical regions. The spasmodic pain is due to an attempt on the part of the obstructed intestine to overcome the obstruction by exaggerated peristaltic action. As the condition advances, the pain begins to decrease in severity, for the intestinal musculature is becoming gradually exhausted. The colicky spasms change to intermittent waves of pain, which in turn pass on to a stage of continuous abdominal discomfort. Finally with complete exhaustion of the gut, the pain may disappear altogether.

Vomiting is practically a constant manifestation. Its cause is still uncertain, though some believe it is initiated by the presence of a toxic substance produced in the obstructed intestine. It would seem that the bowel, being unable to empty itself downwards, ejects its contents upwards. The higher the obstruction, the earlier the onset of the vomiting, and the greater its severity. In large bowel obstruction, vomiting may be late and even absent, but nausea is a constant feature. The vomited material, which at first consists of gastric contents, soon changes to the greenish bilious contents of the duodenum. In the late stages, the brownish, foul-smelling contents of the small intestine are expelled, and the vomitus is then termed faeculent. When this occurs the prognosis is grave.

Constipation occurs early in low obstruction, late in high. Though demonstrable in all cases sooner or later, it is unwise, according to Cope, to delay twelve to twenty-four hours to determine its existence if the other symptoms of intestinal obstruction be present. Of frequent incidence is the occurrence of an evacuation, concurrent with or shortly after the onset of pain, with no subsequent movement of the bowels.

Some degree of shock always accompanies intestinal obstruction. It is manifest particularly in children. Its intensity will depend upon the severity

and site of the obstruction. Strangulated hernia, acute volvulus, and internal strangulation produce an obstruction that is sudden and complete and hence the accompanying shock in these conditions is profound. On the other hand, strictures involving the intestinal lumen, bring about a gradual occlusion, and as a result, the shock produced is slight. Again, in obstructions high up in the small gut, shock is greatest, while in large bowel obstructions it is absent or insignificant.

The condition of acute obstruction of the gut has not endured very long before the patient begins to present a general picture of toxaemia and dehydration. The toxaemia, it is believed, is due to the elaboration of some toxic material in the obstructed intestine. The dehydration is consequent upon the failure of reabsorption of the tremendous amount of fluid poured into the small intestine, and the loss of fluid by vomiting. Dragstedt believes that obstruction of the bowel stimulates and increases the secretion of fluid into the intestine. The higher the level of the obstruction, the earlier will the symptoms make their appearance, and the more severe will be their character. Thus, in obstruction high up in the small intestine, dehydration and toxaemia soon become extreme. A distressed, anxious expression appears on the patient's face. He lies weak and pale, with sunken eyes, sweating skin, and cold extremities — the picture of collapse. The thirst is terrible. The pulse is feeble, rapid, and thready; the blood pressure subnormal; the temperature often a little elevated. The patient suffers greatly from colicky pain and vomiting. Quarts and quarts of dark discoloured fluid may be ejected. In the late stages, vomiting frequently gives way to hiccough, a sign of serious prognostic significance.

Pain, vomiting, constipation, and shock are the earliest symptoms. Later, three other features make their appearance: abdominal distension, obdominal tenderness, and visible peristalsis. Of these, distension is the first to appear, but the diagnosis should be made before it becomes marked. It is most apt to be prominent in obstruction of the large intestine and lower end of the small intestine, being evident rather late, or even absent, in obstruction high up in the small intestine. It is due to a progressive dilitation of the bowel proximal to the point of obstruction. In the early stages, distension is usually localized, but later, as it steadily increases, it may become general throughout the abdomen. Abdominal tenderness does not become marked until after distension appears. It is a relatively late sign, and frequently indicates that peritonitis has set in. Visible peristalsis, though seen more often in cases of chronic intestinal intestinal obstruction, may also be found in acute obstruction. When present it is a very valuable sign. It is sometimes accompanied by loud, gurgling sounds which can often be heard at a considerable distance from the patient.

The previous history in a case of acute intestinal obstruction is usually one of two main types. In the one case, the story is obtained that the patient, having been in his usual good health, with regular performance of digestion and defaecation, was suddenly seized with a severe, griping pain in the abdomen and a little later began to vomit. Such is the history which will be elicited where the obstruction is due to intussusception, strangulated hernia, or peritoneal adhesions.In the case of intussusception, the patient will be an infant, usually under two years of age, who had been previously healthy. In the case of strangulated hernia, the patient may relate that he has had a hernia for years, which did not give him much trouble. In the case due to peritoneal adhesions, the patient may state that some months or years before he had had an abdominal operation, following which he had been quite well. On the other hand, the patient may

give a history of having been in poor health for some months or even years, during which time he suffered from gradually increasing constipation, and transient attacks of pain in the abdomen, with his present acute attack of colicky pain, vomiting and constipation, as a final culmination. This is the story obtained in a patient in whom the acute obstruction occurred as the end result of chronic obstruction due to carcinoma of the large bowel, or, more rarely, to faecal impaction. Acute intestinal obstruction, then, may occur as a primary condition, or it may be secondary, engrafted upon a subacute or chronic obstruction.

Diagnostic Procedures.

In acute intestinal obstruction, as in all other abdominal emergencies, the time factor is very important, and the shorter the interval between the onset of the condition and the institution of efficient therapy, the better the patient's chance for recovery. If this condition persists unrelieved beyond a few days, death will ensue. Hence, one should act quickly, though thoroughly.

How should we proceed to make a diagnosis? An accurate history, with questioning particularly pertinent to age, type of onset, previous health, previous operations, and character of discomfort, is the first essential. Then comes physical examination, which should be as complete as possible. One should observe the appearance and expression of the patient's face, his general condition, and the position in which he lies. In examining the abdomen, care should be taken to have it well exposed and in a good light. The four routine procedures of inspection, palpitation, percussion, and auscultation, should all be employed. On inspection one should note the rise and fall of the abdomen during respiration, to ascertain whether the movements are equal on both sides, and the presence or absence of any local prominence, old operative scars, distension, and visible peristalsis. In many cases, the careful observation of an abdomen will reveal more than palpation, but the latter is, nevertheless a very important aid to diagnosis. By means of palpation we may detect the presence of a hernia, tumour mass, rigidity, and tenderness. Rigidity is an unusual sign in intestinal obstruction. It occurs characteristically in cases of haemorrhage, perforation, and peritoneal irritation. Ausculation over different areas of the abdomen is according to Ochsner a valuable procedure not only in diagnosing the presence of obstruction, but also in locating its site. He states that the loud, whirring, gurgling sounds of hyperperistalsis constitute the earliest and most constant sign of acute intestinal obstruction. Burgess also stresses auscultation as a valuable procedure in diagnosis. Two methods of investigation which should never be omitted are: (1) a thorough exploration of all hernial orifices, normal and abnormal; (2) an examination of the rectum. Rectal examination may reveal the presence of a stricture or new growth, the head of an intussusception, or the typical red currant jelly stool of intussusception, consisting of blood and mucus. The latter is an important diagnostic sign, and the surgeon should never neglect to examine the diaper of an infant in whom intussusception is suspected.

Aside from physical examination, there are a number of other procedures which have proved of value in making a diagnosis of acute intestinal obstruction. These are:

1. Examination of the vomitus, with respect to its character and odour.

2. Urinalysis. Routine examination reveals a high specific gravity, a slight trace of albumin, and in advanced cases, acetone bodies, the presence of the latter being due to starvation. Special examination of the urine shows an increase in non-protein nitrogen, and a decrease in chlorides.

3. A flat X-ray plate of the abdomen

to visualize the fluid-and-gas-containing coils of dilated intestine. This measure is advocated by Sherry, but Dr. H. A. Bruce states that it is unnecessary and should never be employed because of the delay entailed.

4. A barium enema, in cases of large bowel obstruction. This often helps to locate the site of the lesion.

5. The giving of two turpentine enamata, a few hours apart, to demonstrate constipation in doubtful cases; a procedure, which, according to Cope, is permissible.

The estimation of blood chemistry in acute intestinal obstruction is perhaps more important as a guide to treatment rather than as an aid to diagnosis. The blood changes should be determined as soon as the patient is admitted to the hospital. The typical pathological findings in the blood are: (1) a decrease in the chlorides; (2) an increase in the non-protein nitrogen; (3) a rise in the CO_2 combining power. The alteration in blood chemistry proceeds rapidly, and a condition of alkalosis soon becomes established. The earliest of these changes, it has been shown by Orr and Haden, is the fall in blood chlorides. All these findings occur much earlier, and are much greater in high obstruction than in low obstruction, and serve to indicate the intense derangement of normal function taking place throughout the tissues and fluids of the body.

Dr. W. R. Campbell emphasizes that acute intestinal obstruction should be diagnosed before any chemical changes occur in the blood, since, by the time these changes make their appearance, the obstruction has existed for at least five hours. He also points out that the fall in blood chlorides favours the onset of an intestinal paresis, which in turn causes a more marked hypochloraemia by resulting in an increase in the exudation into the intestines, of fluid containing sodium chlorides. Hence a vicious circle is established, whose ultimate result, unless the condition be alleviated by saline administration, is total paresis of the intestine with intense alteration in blood chemistry.

Precautions.

It is well to stress certain precaution to be employed in a suspected case of acute intestinal obstruction. The physician should take care:

1. To avoid delay. The occurrence in a patient, of severe colicky pain in the abdomen, accompanied by vomiting, points to the presence of an acute abdominal condition, and if the vomiting persists, becoming greenish and foul-smelling ,it is very likely that this condition is one of acute obstruction of the gut. In any case, the hospital is always the best place for such a patient. In a hospital, there are facilities for determining the blood chemistry, and thus efficient treatment may be established. To temporize for the sake of diagnostic accuracy is rarely excusable. The case has been cited of a doctor in a rural district in Ireland who confided to his consultant that he was at last certain he was dealing with a case of acute intestinal obstruction, for he had been watching the vomiting for a week, and it was now truly faecal. It must be emphasized that such features as faecal vomiting, absolute constipation, distension, abdominal tenderness, and visible peristalsis, are late occurrences in intestinal obstruction, and the physician who hesitates in his decision until they have appeared, is only inviting tragedy. To quote Burgess: "The only hand that ever paints a complete clinical and pathological picture of any morbid state, is the hand of Death."

2. To give nothing by mouth, for it will not be retained.

3. To make no attempt at purgation as a diagnostic aid, its only effect being to produce an increase of pain and vomiting.

4. To refrain from the use of bismuth meals, for they interfere greatly with surgical emptying of the bowel.

5. To give no morphia, for it masks

the symptoms, and may induce intestinal paralysis.

Differential Diagnosis.

In the absence of abdominal distension, acute intestinal obstruction must be distinguished from all the other acute abdominal conditions. In the acute inflammations, such as acute appendicitis, acute cholecystitis, and acute pancreatitis, the onset of the pain is less sudden; rigidity, which is typically absent in obstruction, is a characteristic sign; vomiting is less frequent, and does not tend to become faeculent. In perforation of a gastric or duodenal ulcer, there is present true involuntary muscular rigidity from the onset, and again faeculent vomiting does not ocuur. In the colics, renal and biliary, the pain has a typical location and radiation, faeculent vomiting is not present, and neither constipation nor distension supervene. An ovarian cyst with a twisted pedicle is excluded by the absence of faeculent vomiting. In ruptured ectopic pregnancy, too, the vomiting does not become faeculent, and further, the signs of internal haemorrhage will be present. Tabes Dorsalis, in the form of gastric crisis, frequently causes severe abdominal pain accompanied by uncontrollable vomiting. However, testing the pupillary reactions and knee-jerks will eliminate this condition.

In a case in which distension has already occurred, one should attempt to rule out mesenteric thrombosis, uraemia, late peritonitis, and intestinal paresis. Mesenteric thrombosis is almost impossible to distinguish from acute intestinal obstruction. It is usually diagnosed only after the abdomen has been opened. In uraemia, the changes in blood chemistry are characteristically different from those which occur in obstruction. The non-protein nitrogen is high, but chlorides are seldom decreased, and the CO_2 combining power rarely elevated. In late peritonitis, faeculent vomiting is less common than in acute intestinal obstruction. To differentiate intestinal paresis from acute mechanical obstruction of the gut, is of the utmost importance, for the latter condition demands prompt surgical intervention. In intestinal paresis the onset is insidious and the picture much less dramatic. Abdominal pain and tenderness are absent, and vomiting seldom occurs before the third day. On auscultation, one notes, the marked contrast between the turbulent gurgling sounds of mechanical obstruction, and the death-like silence of intestinal paresis.

To sum up, then, the presence of colicky pain, faeculent vomiting, and a state of alkalosis, indicate that we are dealing with a case of acute intestinal obstruction, while the presence of muscular rigidity points to some acute abdominal condition other than intestinal obstruction.

Treatment.

The course of treatment to be employed in a particular case will depend upon the duration of the obstruction. Chemical analysis of the blood is of paramount importance in every case of obstruction, and should be done as soon as possible. In a case seen early before marked chemical changes have manifested themselves in the blood, immediate surgical interference for the direct removal of the cause of the obstruction, is justified. In advanced cases, however, a different course should be pursued. Hitherto it has been taught, that immediately upon diagnosing a case of acute intestinal obstruction, the patient should be operated upon. However, in a recent paper, Orr and Haden point out that such a procedure is apt to be dangerous. They state that it is never justifiable to subject a patient with marked dehydration and blood changes to a major operation of this sort, without employing adequate preoperative measures to improve the risk. The preoperative measures are:

1. Relief of Dehydration.
2. Relief of Hypochloraemia.

Dehydration is a constant finding in upper gastro-intestinal tract obstruction. The patient suffers intense thirst as a result of the great fluid loss, and to relieve this condition, no less than four to six litres of liquid should be given every twenty-four hours.

Fluid should always be given as sodium chloride solution, which serves the double function of relieving dehydration, and restoring the chloride content of the blood. Normally, the blood chlorides range between 450 and 500 mgm. per 100 cc. of blood. In acute intestinal obstruction, the chlorides may be reduced to less than half the normal amount. The administration of sodium chloride solution should be in sufficient quantity to cause the blood chlorides to return to normal. Interstitially and intravenously, 3 to 4 litres of water, and 50 to 75 gm. of salt solution may be given in 2 to 4 hours. Administered very slowly, 5 per cent. saline may be injected intravenously and 2 per cent. saline interstitially. Orr and Haden recommend that about an hour be taken to introduce 500 cc. of a 5 per cent. salt solution intravenously. It has been found that reducing the hypochloraemia tends also to restore the other chemical changes of the blood to normal.

Once the patient's condition has been improved by pre-operative treatment, operation should be undertaken without delay. Even though an accurate diagnosis has not been made, an exploratory operation is justifiable. The object of surgical intervention is primarily to relieve the obstruction. At a later date, when the patient has recovered from the toxaemia and symptoms of his acute illness, the mechanical cause of the condition may be removed. The obstruction is best relieved by production of a fistula, either an enterostomy or a colostomy, above the site of the block. By establishing drainage of the bowel in this way, relief of the distension, with evacuation of the pent-up faecal material, will be obtained. The value of a jejunostomy, which has been stressed by Wilkie, Mayo, and others, is doubted by Hayden and Orr. They believe that adequate drainage of the gut will generally result if an upper left rectus incision is made, and the first portion of small intestine presenting, is drained.

Following operation, the administration of large amounts of saline should be continued, until the patient is out of danger. Further, attention should be directed towards the relief of starvation, for, during several days of severe illness, the patient has been able to take no food. Hence, to restore the depleted energy, administration of 10 per cent. glucose intravenously should be begun early, and continued until the patient is able to take food by mouth.

We recognize, then, five phases in the treatment of acute intestinal obstruction:

1. Relief of dehydration.
2. Relief of hypochloraemia.
3. Drainage of the bowel.
4. Relief of starvation.
5. Removal of the mechanical cause of the obstruction.

Lethal Factors:

As yet, the cause of death in acute intestinal obstruction is undetermined. Many theories have been formulated, and each has its ardent supporter. Wilkie believes that death is due to dehydration, a view first advanced by Hartwell and Hoguet. Gamble and McIver blame the loss of electrolytes sodium and chlorine. Wagensteen and Chunn state that dehydration and loss of chlorides are the factors responsible. Gatch and his co-workers attribute death to dehydration, loss of chlorides and starvation. Many believe that absorption of toxins from the obstructed bowel is the important factor. Orr and Haden, while admitting these opinions as possibilities, are in accord with none of them, and prefer to regard the cause of death as unproven.

Prognosis:

Finally, a word as to prognosis. Three things save life: early diagnosis, early intravenous saline, early operation.

REFERENCES.

1. Rowntree, L. G., Physiol. Rev. 2: 116, 1922.
2. Hughson, W., and Scarff, J. E., Bull. Johns Hopkins Hosp. 35: 197, 1924.
3. Cope, Z., The Early Diagnosis of the Acute Abdomen.
4. Nelson's System of Surgery: Acute Ileus.
5. Burgess, A. H., Lancet, 216: 857, 1929.
6. Haden, R. L., and Orr, T. G., J. Exper. Med. 37: 465; 38: 55, 1923.
7. McIver, M. A., and Gamble, J. L., J.A.M.A. 91: 1589, 1928.
8. Haden, R. L., and Orr, T. G., J.A.M.A. 91: 1529, 1928.
9. McVicar, C. S., and Weir, J. F., J.A.M.A. 92: 887, 1929.
10. Perrin, W. S., and Lindsay, E. C., Brit J. Surg. 9: 46, 1921.
11. Campbell, W. R., Personal Communication.
12. Cole, L., Lancet 1: 128, 1929.
13. Sherry, L. B., Am. J. Surg. N.S. 7: 242, 1929.
14. Bruce, H. A., and Rush, J. W., C.M.A.J. 21: 269, 1929.
15. Orr, T. G., and Haden, R. L., Ann. Surg. 89: 354, 1929.
16. Wilkie, D.P.D., Brit. M. J., 2; 906, 1925.
17. Wagensteen and Chunn, Arch. Surg. 16: 1242.
18. Boies, L. R., Journal-Lancet, 48: 568, 1928.
19. Gatch, W. D., Trusles, H. M., and Ayers, K. D., Surg. Gynec. and Obst. 46: 332, 1928.

A Review of Experimental Work on Acute High Intestinal Obstruction.

By I. L. CHAIKOFF.

Origin of Toxin.

As early as 1902, Albeck pointed out that the intestinal contents above an obstructed portion, contain a toxic material, and later experiments by Whipple and his collaborators have done much to determine the nature and place of origin of this poisonous substance. These observers stated that dogs with closed duodenal *loops* die in about 2 days with signs and symptoms in a general way similar to those in patients suffering from high intestinal obstruction, namely, vomiting, dehydration, low blood pressure, subnormal temperature and splanchnic congestion. They also found that the material accumulating in the closed duodenal loop is very toxic when administered intravenously, subcutaneously or intraperitoneally, giving rise to symptoms similar to those recorded above. Whipple stressed the point that nothing produced within the lumen of the gut was the cause of the intoxication, for he and his co-workers reported that the feeding of the material obtained from the obstructed intestine or its injection into the normal or obstructed intestine or its injection into closed loops of intestine did not cause the characteristic toxaemia. By the use of closed washed loops of intestines they were able to eliminate as the source of this toxin, the gastric and pancreatic juices, bile and the products of food digestion. From the mucosa of these

*My thanks are due to Prof. N. B. Taylor for criticism and suggestions in the preparation of this paper.

loops they isolated a toxic substance which when injected into normal animals produced profound shock. This toxic material could not be obtained from the epithelial lining of the normal intestinal tract. Whipple believes that under obstructed conditions, this toxic material is elaborated solely by the cells of the intestinal mucosa from where it is in part taken up by the blood stream causing the characteristic clinical reaction, and in part is excreted into the lumen of the intestine. Once this toxin reaches the lumen of the gut, he states that it is inert as far as the host is concerned. By the use of fluoride, they were able to destroy the mucosa of the loop and under these conditions they found the absence of the typical syndrome of acute obstruction, the animal dying rapidly with a terminal bronchopneumonia, oedema of the lungs and bacterial invasion of the peritoneum. The contents of the loop were in the nature of an inflammatory exudate and were wihout ill effects when injected into normal animals. This experiment, Whipple and his collaborators regard as proving beyond a doubt, that the seat of formation of the toxin is in the mucosa cells. One should, however, be guarded in drawing conclusions from such an experiment, for not only is it likely that the terminal bronchopneumonia may have masked the characteristic toxemia of obstruction, but the possibility that the inflammatory exudate may have destroyed the toxin within the lumen of the obstructed gut has not been ruled out.

The bacterial origin for this toxin has been put forth by some investigators. Dragstedt and his co-workers also isolated from occluded loops a fluid which was relatively harmless when administered to normal animals by mouth, and extremely toxic when given intravenously. These workers brought out the following points:

1. Open isolated portions of the small intestine do not produce the profound shocked conditions in animals when their secretions are drained directly into the abdominal cavity.
2. Closed isolated intestinal loops previously rendered sterile by prolonged drainage into the abdominal cavity give rise to no untoward symptoms.
3. Sterile closed intestinal loops produce no adverse symptoms even on complete autolysis of the mucosa through occlusion of the blood supply.
4. It is impossible to sterilize the intestinal loop by the use of chemical antiseptics but by washing the loop with ether or alcohol before occlusion, a delay in the progress of the toxaemia can be effected, producing no symptoms at all in 50 per cent. of the cases.

Dragstedt and his associates do not subscribe to the view that a poisonous substance is elaborated by the mucosa cells in the obstructed gut, for no untoward results were observed in those cases where the loops were left to drain into the peritoneal cavity, and in these cases where bacterial growth had been retarded. They state that two factors are essential for the production of the toxic material, namely, a proteolytic strain of intestinal bacteria, and injury to the intestinal mucosa which may occur as the result of distension or interference with the blood supply.

The evidence for this theory is strong, and even Whipple, who does not believe in the bacterial origin of the toxin, is careful to point out that dogs with closed duodenal loops which have been washed out survive on the average a little longer than animals with unwashed loops. By merely draining such loops, Whipple and his co-workers reported that the animals survived for a longer period, although these animals in the end also succumbed with the symptoms of toxaemia If, as Whipple states, the only source of the poison as far as the blood is concerned be the cells of the mucosa, it is difficult to un-

derstand the prolongation of life associated with simple drainage of the loop.

The severity of the symptoms have been repeatedly observed to depend upon the position of the obstruction, these being more marked the higher the obstruction. In view of the fact that the bacterial flora of the small intestine becomes less abundant as we approach the pylorus, it has been suggested that bacteria cannot play a part in the production of the toxic substance. Recent work, however, has shown that the upper intestinal tract is not quite devoid of organisms, and these are particularly apt to become increased in number when there is interference in the chemical or motor functions of the intestinal tract.

Morton offers an ingenious hypothesis for the difference in the severity of the toxaemia of upper and lower obstruction of the small intestine. He believes two factors responsible for this difference:

1. Greater capillary circulation to the upper portions of the small intestine which makes it possible for this part of the gut to absorb toxin more rapidly and in greater concentration.
2. Secretion rate of fluid which is much greater in the duodenum than ileum.

This second factor leads to an increased intra-enteric pressure which is concerned with squeezing out of the retained toxins into the general circulation.

Curiously enough, it has been demonstrated that a closed loop of the *large* intestine may exist for several weeks in dogs without producing ill effects. No explanation for this has been forthcoming. It is difficult to correlate this finding with the bacterial theory which seems well supported, as far as the *loop experiments* of the small intestine are concerned, by the work of Dragstedt and his co-workers.

Chemical Nature of Toxin.

There is a diversity of opinion with regard to the chemical nature of the toxic material isolated from the fluid contents above the point of obstruction, but in the main, four substances have been suspected of being identical with this poison: proteose, histamine, nucleoprotein and bacterial toxin.

G H. Whipple and his associates found that this toxic material may be thrown out of a solution rich in albumin by boiling, but that after digestion or autolysis, it resists boiling. It is non-dialysable and does not pass through an earthen filter. It is remarkably stable to boiling and to the action of such enzymes as erepsin and pancreatic juice. Complete precipitation from its solution may be brought about by the addition of 5 volumes of alcohol or of ammonium sulphate. It is not absorbed from the alimentary tract for the administration per os is without effect. Whipple found that dogs could be immunized against toxic injections by means of previous administrations of sublethal doses of this toxin, but Dragstedt and his collaborators have failed to confirm this observation. These properties and the chemical process of purification which he used, led G. H. Whipple to the belief that the toxin was a primary proteose.

Histamine (an inorganic base produced from most proteins by putrefaction) and combined histamine-derivatives have been suggested as the toxic materials produced in the intestinal tract by obstruction. Gerard was able to show a close similarity between the obstruction fluid and histamine, as regards their effect on isolated strips of intestine, and the toxaemia produced in dogs by intravenous administration of these substances. He was further able to identify 2 or 3 milligrams of the dehydrochloride of histamine per 100 c.c. of fluid contents of the isolated loop. Koessler and Hanke introduced as much as 100 milligrams of histamine into the duodenum of a normal dog without producing any ill effects, but Meakins and Harington reported that interference with the blood supply to the gut led to

a rapid absorption of histamine for a short time, and later to almost complete cessation in absorption. It would appear, therefore, that histamine plus interference with the normal condition of the wall of the intestine might be the causative factor leading to the toxaemia.

Ingvaldsen, A. O., Whipple et al, obtained about one gram of the purified material from the obstructed intestines of 14 dogs. They confirmed the work of G. H. Whipple and associates with regard to the chemical properties of the toxin, but believed the poison to be a nucleoprotein since by analysis, they found phosphoric acid and pentose present. These workers found no histamine in the purified material, but in the fluid contents of the obstructed bowel they were able to identify a trace of histamine which they state is insufficient to account for its toxic nature.

The part that bacteria plays in the production of the toxin has already been referred to above. Williams has recently suggested that the toxin of Bacillus Welchii is responsible for the toxaemia of the obstruction and by the use of Bacillus Welchii antitoxin he has reported a reduction in the mortality of patients suffering from obstruction. Further work in this field is necessary before one can estimate the value of this theory. It is unlikely, however, that the toxin isolated by the Whipples bears any relationship to the toxin of the Bacillus Welchii, for the latter is not thermostabile, whereas the former is still active after being subjected to high temperatures.

A marked similarity in the signs, symptoms and pathology, in dogs suffering from repeated administration of large doses of parathormone, with dogs in which small intestinal obstruction had been produced by closed loop experiments, has been pointed out by Prof. N. B. Taylor. He found the blood calcium of obstructed dogs to rise as high as 16 mg. per 100 cc. of blood. A decision as to whether the similarity is due to the dehydration which occurs in both conditions or whether increased secretion by the parathyroid glands causes the symptoms of acute obstruction, must await further experimentation.

Chemical Changes in the Blood.

The constant chemical changes that occur in the blood as the result of acute high intestinal obstruction are an increase in the non-protein, a decrease in the chlorides and a rise in the carbon dioxide combining power of the plasma.

The high non-protein nitrogen of the blood is due almost entirely to increased urea content. It is not the result of the slight decrease in kidney function associated with acute obstruction, for in obstructed *animals* there is in addition, a marked increase in the excretion of urea in the urine. Nor is the blood concentration resulting from dehydration sufficient to account for this increased N.P.N. of the blood, for although the latter may be as high as several hundred per cent. above normal, the concentration of the blood, as indicated by reduction of plasma volume, amounts to about 15 or 20 per cent. The conclusion is drawn that the contributing factor to the high nitrogen findings in obstructed *dogs*, is the accelerated breakdown of protein occurring as the result of the toxic substance or dehydration. Hartman and Smyth have made the interesting suggestion that the increased urea of the blood might be related to the osmotic balance of the blood.

Haden and Orr showed that the fall in chlorides was the earliest change to occur in the blood and were able to confirm the early observations of Hartwell and Hoguet with regard to the beneficial effects of sodium chloride in upper gastro-intestinal tract obstruction, prolonging the lives of treated dogs to approximately 20 days, or 6 times as long as untreated animals. At the time of publication of this work

they stated that the chlorides of the blood act as a neutralizing agent reacting with the toxin as follows:

$$X + NaCl + H_2CO_3 = NaHCO_3 + X(HCl)$$

(toxic) (non-toxic)

Their subsequent experiments disprove this hypothesis, for they found that the administration of chlorides in any other form than that combined with sodium, had no therapeutic value. Again, if their theory is correct, we should expect a retention of chlorides in the tissues in combination with the toxic material, but in the liver and muscles of obstructed dogs they found a decreased chloride content. Later observations have shown that the loss of chlorides from the blood and tissues may be accounted for by the chlorides excreted into the urine and into the gastric and intestinal juices.

A distinct step forward in the solution of this problem was made by Gamble, Ross and their co-workers, who point out that the volume of body fluids depends upon its total ionic content and that the loss of fluids from the body runs parallel with the loss of dissolved electrolytes. Sodium and chlorine are the ions of prime importance in maintaining the quantity of fluids in the blood plasma and in the interstitial spaces, for in both these locations, the chloride ion is the chief constituent of the acid factors while the sodium ion constitutes nearly all of the base. Between 5 and 7 litres of digestive juices are normally secreted into the lumen of the intestine daily, and the chief inorganic constituents of this fluid are HCl and NaCl. In the usual course of events this fluid is almost completely reabsorbed. In acute high intestinal obstruction where there is interference with reabsoption as well as a tremendous outpouring of fluids into the distended gut, there occurs a loss of water and electrolytes from the plasma and interstitial spaces.

In forms of acute obstruction, other than closed loops, or where there is gross interference with the blood supply, McIver and Gamble believe that the symptoms and death are due to the loss of water and inorganic salts from the plasma and interstitial spaces, and to the disturbed acid-base balance of the blood. As evidence that dehydration is the causative factor in death, they point out that in acute obstruction, the symptoms may be averted and death prevented by the administration of adequate amounts of physiological solution of sodium chloride. In this type of obstruction, they regard the assumption of a toxin elaborated either in the mucosa or by bacteria as unnecessary. Dr. Shouldice also considers that no special toxic substances are involved in acute obstruction. In his work on obstructed loops, he reported that rupture of the loop due to powerful peristaltic waves, followed by peritonitis, was the cause of death.

Since gastric juice contains among other substances HCl and NaCl, it is readily seen that in acute high intestinal obstruction there is lost from the plasma relatively more chlorine than sodium, leading to a decrease in the amount of chloride ions in combination with the basic ions. The loss of chloride ion will be compensated by the HCO_3 ion with the resulting increase in the carbon dioxide combining power of the plasma. The usual accompaniment to the continued loss of stomach secretions by producing obstruction at the pylorus is alkalosis, but an acidosis may also be produced when the obstruction, usually in the lower portion of the small intestine, is assimilated with a loss of duodenal digestive juices which contain fixed base in greater amounts than chloride ion.

Gamble and Ross have also shown that the loss of chloride ion alone does not result in the decrease of electrolytes, for it is readily replaced within the body fluids by the HCO_3 ion. The loss of sodium is of more serious import, for not only does it decrease the concentration of basic ions, but in addi-

tion, the tissues are deprived of an equivalent amount of HCO_3 ion which was held in conjunction with the lost sodium. The loss of sodium is therefore the more important factor as a cause of the dehydration.

These observations of Gamble and his associates explain the therapeutic efficacy obtained by the administration of sodium chloride and the failure of Haden and Orr to prolong life with such substances as distilled water, solutions of glucose, calcium chloride, potassium chloride, etc. To restore fluids to the plasma and intestinal spaces, it is necessary to supply the lost electrolytes.

BIBLIOGRAPHY.

Albeck, Arch. F. Klin. Chir., 45, 569, 1902.

Cooper, Arch. Surg. 17, 918, 1928.

Med., 25, 421, 1917; ibid, 27, 359, 1918; ibid, 30, 109, 1919; Am. J. Physiol., 46, 366, 1918.

Dragstedt and associates, J. Exter. Med. 25, 421, 1917; ibid. 27, 359, 1918; ibid, 30, 109, 1919; American J. Physiol., 46, 366, 1918.

Gerard, J. Biol. Chem., 52, 11, 1922; J.A.M.A., 79, 1581, 1922.

Hartmann and Smyth, Am. J. Dis. Child., 32, 1926.

Haden and Orr, J.A.M.A., 91, 1529, 1928.

Hartwell and Hogust, Am. J. M. Sc., 143, 357, 1912.

Ingvaldsen, Whipple, A. O., Baumann and Smith, J. Exper. Med., 39, 117, 1924.

Koessler and Hanke, J. Biol. Chem., 59, 889, 1924.

McIver and Gamble, J.A.M.A., 91, 1589, 1928.

Meakins and Harington, J. Exper. Ther., 20, 45, 1922.

Morton, Arch. Surg., 18, 1119, 1929.

Whipple, G. H., and associates, series of papers in J. Exper. Med. extending from 1913 to 1919.

Williams, Brit. J. Surg. 14, 295, 1926-27.

The Hippocratic Oath.

By BLISS MACQUARRIE, 3T4.

Ethically the most influential document in the history of medicine is the Hippocratic Oath, still administered to the young doctors of Europe and America, though modified to suit ways of instruction which do not keep to the ancient paternal intimacy of teacher and disciple.

"I swear by Appollo the physician, and Aesculapius, and Health, and Allheal, and all the gods and goddesses, that, according to my ability and judgment, I will keep this oath and this stipulation: to reckon him who taught me this Art equally dear to me as my parents, to share my substance with him, and relieve his necessities if required; to look upon his offering in the same footing as my brothers, and to teach them this Art, if they shall wish to learn it, without fee or stipulation; and that by precept, lecture, and every other mode of instruction, I will impart a knowledge of the Art to my own sons, and those of my teachers, and to disciples bound by a stipulation and oath according to the law of medicine, but to none others. I will follow that system of regimen which, according to my ability and judgment, I consider for the benefit of my patients, and abstain from whatever is deleterious and mischievious. I will give no deadly medicine to any one if asked, nor suggest any such counsel; and in like manner I will not give to a woman a pessary to produce abortion. With purity and with holiness I will pass my life and practice my Art. I will not cut persons labouring under the stone, but will

leave this to be done by men who are practitioners of this work. Into whatever houses I enter, I will go into them for the benefit of the sick, and will abstain from every voluntary act of mischief and corruption; and, further, from the seduction of females or males, of freemen and slaves. Whatever, in connection with my professional practice or not in connection with it, I see or hear, in the life of men, which ought not to be spoken of abroad, I will not divulge, as reckoning that all such should be kept secret. While I continue to keep this oath unviolated, may it be granted to me to enjoy life and the practice of the Art, respected by all men, in all times! But should I trespass and violate this oath, may the reverse by my lot!"

Here we have an early record of those noble rules of conduct, loyal obedience to which has raised the art of medicine to the high position it now holds. Hippocrates is said to have forced his pupils by this oath to accept certain rules of conduct with regard to silence, speech, gait, manner and character. He gives instruction on these points in two works of the Hippocratic Collection, "Precepts," and "Decorum," which, after the oath, give us most information about ancient medical etiquette.

Questions arise in our minds when we read this oath. What was its sanction? Did any penalties follow the breaking of it? Did all medical students swear to it, or only those belonging to a community or guild? Was it ever actually administered, or was it a mere counsel of perfection held up to the respectful admiration of practitioners? It is fairly certain that a doctor who did not follow this oath was not punished unless he sinned against the laws of the State. The writer of a tract in the Hippocratic Collection says that the only penalty to which the erring doctor was subject was dishonour, and he adds that this was no punishment to those who were "compacted of it". This slackness of the discipline exercised by the State accounts for the stringency and the solemnity of the oath. In days when there was no General Medical Council it was necessary to make every possible appeal to religious scruples and to the moral sense.

The first part of the oath states that a person subscribing to it must give special favours to his teacher and his family, and keep the secrets within his teacher's and his own family. We have here some of the essential elements of a guild or a trade union. Although Galen knew nothing of the oath, he relates how ancient physicians comprised "a clan of Asclepiadae," who passed on a knowledge of anatomy by teaching it to their sons. They laid claim to superior knowledge and skill, but probably had ceased to exist before Galen's time. It is thought that the oath was the test required before an outsider became a member by adoption of this Asclepiad clan. This view is not inconsistent with the account of the clan given by Galen. It is clear that the oath binds the apprentice to a society approximating to a guild or trade union. We do not know for certain if this society was a secret one, but other Hippocratic works lend plausibility to this view. "Precepts" and "Decorum" are very like addresses to secret societies, and in the former, a genuine physician of sound principles is termed "one who has been made a brother" — surely a brother of a fraternity or guild.

Custom and convenience, to say nothing of human conscience, would sooner or later lay down most of the rules of conduct comprised in the oath, but there is one sentence which appears strange, and no solution of the problem hitherto offered, seems entirely adequate.

It is usually translated as "I will not operate for stone"; and the question at once arises whether the operation for stone was ever forbidden by

custom or etiquette, but on this point antiquity is perplexingly silent. The operation is often described, e.g., by Celsus, but no writer positively states that he has performed it himself. As to operations generally, the Hippocratic writers performed them without fear or scruple. The only light thrown on this dark problem is the statement of Galen, that in Rome operations were performed by a special class whom he called "surgeons." The operation clause—does not appear in the Christian form of the oath. So it may be assumed that it did not belong to the original form, but was afterward added to suit the prejudices of physicians of a certain period Quite possibly it was the ban on operations, noticed by Galen in Rome, which caused this clause to be inserted in our Hippocratic text.

The oath is the main authority for ancient medical etiquette, the other sources being Law, Physician, Decorum and Precepts, supplemented by a few remarks in Galen. Issuing from these there gradually developed certain rules of behaviour:

1. To call a consultant when such a course is necessary;

2. To act as a consultant when requested to do so;

3. To take a patient's means into account when charging a fee;

4. To be clean, well mannered and dignified.

The age of oaths and tests seems to be passing away. They tend to become optional and then disappear. But they have, nevertheless, played a great part in the history of men's moral growth. The oath must have contributed much to form a high code of medical honour, even in those ages when it was no longer a test to which the graduating physician subscribed. At the present day, medical ethics and etiquette are based upon it. Like his Hippocratic predecessors, the modern doctor refuses to shorten life, to cause abortion, and to divulge information committed to his honour; and even though doctors no longer form a brotherhood with communistic principles, they still attend the families of their fellow practitioners without charging a fee. Hippocrates was a high-minded physician, and his methods have formed the basis of all departments of modern progress.

The Boston Congress.

By F. BURNS PLEWES, M.A.

The fifteen-odd Toronto physiologists who journeyed to Harvard for the Thirteenth International Physiological Congress, found much of interest, and a full program. This gathering is held once in three years at the various leading research centres of the world, the first being held at Basel, Switzerland, in 1889.

To the neophyte, the biggest thing of all was to see and meet men whose names have been before him in the news, as well as in texts, since his first lecture in biology.

August Krogh, whose name every Med. knows from his work on capillary circulation, gave the opening address, in very broken English. When we read it afterwards, we found it very good. It included a plea for less large-scale research organization, and more organization of the literature and services behind the research front.

I. P. Pavlov was recognized, along with Leon Frederick, to be the unofficial dean of the Congress. His entrance to a lecture hall or to a banquet was the signal for all to rise and clap, and his paper, which was given in Russian and translated, sentence by sentence, on "The Inhibition in the Normal Activity of the Cerebral Hemispheres."

was given before the largest audience of any of the regular papers.

Among other eminent men, the following were very familiar by name: Adrian, Kato (the all-or-none law in nerve), the Lapicques (chronaxie), Graham Lusk (metabolism, and texts on nutrition), Howell (President of the Congress and textbook author), Folin and Wu (blood sugar determination), Mellanby and Lovatt Evans (who had been examining in Toronto on the F.R.C.S. examinations), von Frey, Abderhalden, Yandell Henderson, Bottazzi, Needham.

Five papers were given by University of Toronto workers, and several others by men who had left this University but recently. Among the most interesting of these was the paper read by Dr. Soskin, a graduate of '26, and senior demonstrator in physiology, because it embodied views held by the University and widely contradicted.

"S. Soskin and W. R. Campbell—The Utilization of Carbohydrate by Totally Depancreatized Dogs, Receiving No Insulin."

Dr. Soskin's paper was given before a very large audience, and he had no difficulty in answering all questions very satisfactorily. Undoubtedly the discussion would have been more heated if its chief critic, Graham Lusk of Cornell, had not been giving a paper on phlorhixinized dogs, in another building, at the same time.

"C. H. Best and E. W. McHenry—The Inactivation of Histamine." Professor Best's paper was received with evident interest by a crowded hall.

"V. E. Henderson and G. H. W. Lucas—The Effects of Cyclopropane as an Anaesthetic." The new anaesthetic, which does not disturb blood pressure nor respiration, of which Torontonians have heard so much, lately.

"N. B. Taylor and A. Fine—The Excretion of Calcium through the Intestine in Parathyroidectomized Animals." Dr. Taylor's paper was a resume of his findings during extensive research on calcium metabolism, continued this last year by T. H. Hodgson and D. Johnston.

"Laurence Irving—The Source of Expired CO_2 and Site of Its Retention." From work carried on in the last two years with G. Bastedo, J. C. Thomas, J. K. W. Ferguson and F. B. Plewes. Dr. Irving's paper goes into the question of acid-base equilibrium in the tissues.

Dr. Magee of Aberdeen read a paper on work he had done recently with Dr. J. J. R. Macleod, "Diffusion Through the Walls of Surviving Intestine."

Dr. J. M. Luck, who used to demonstrate in Biochemistry and is now in California, read a paper on "The Formation of Nitrogenous Intermediates in the Catabolism of Amino Acids."

Dr. Markowitz, now of Rochester, was co-author with Mann and Bollman of "A Study of the Relation of the Liver to the Process of Coagulation of the Blood."

We found our obscurity amid so many of the great and near-great of the physiological world considerably lessened when it was known that we were from Toronto! Of course we of Toronto realize our own importance, but it is a shock to discover what a place our school has attained in the opinion of others. The first room we entered to find our quarters—the big pine-panelled common room, presented, in ten-inch gold letters over the door, the name "Charles Herbert Best." The only other room in those Medical Dormitories that was named was Bowditch Hall, after the first American physiologist.

Most of the seventeen hundred physiologists with whom we came in contact, Germans, Chinese, Danes, and Americans, asked, after the usual, "Where do you come from?" for Dr. Macleod and Drs. Banting and Best.

The papers of medical interest were too many to mention. Professor A. V. Hill demonstrated his famous apparatus for the measurement of heat production in nerve. Drs. Harvey Cushing and Teel gave a paper on the hypophy-

seal hormone for growth and for reproductive processes. Professor Babkin spoke (as he did last year here) on the innervation of the salivary glands.

Yandell Henderson and Co'y demonstrated experiments showing the relief of atelectasis and pneumonia in dogs by breathing air rich in CO_2. S. Voronoff talked about the physiological results of testicular grafting. Boris Sokoloff on the action of Corferrol on experimental malignant tumours.

Abstracts of all the papers will be found in the American Journal of Physiology for October, 1929.

Since this was the first Congress held in America (the first ever held out of Europe) the famous Beaumont was honoured as "patron saint," and every member of the Congress was presented with a copy of his original work on gastric secretion and a medal stamped with his profile and the occasion of its presentation.

EDITORIAL

Many excellent works have been written on subjects relating closely to the life of the physician. Some of these are classics which can be read and reread with great benefit and enjoyment by student and graduate. Biographies of such men as Lord Lister or Sir William Osler, and medical masterpieces such as Hilton's "Rest and Pain" will afford food for thought and timely inspiration for all of us. The reading of such books forms a valuable adjunct to the friendly associations with teachers in our undergraduate training.

After becoming mentally fatigued in the process of absorbing Anatomy from Gray, or Surgery from Rose and Carless, one can refresh one's cerebral cortex by viewing, through the written page, Leeuwenhoek, Pasteur and others at work and at play A great many books will afford amusement as well as interesting sidelights on the practice of ancient medical art.

It is our belief that these works should be made available to students, especially during their junior years. It is felt that there is a desire on the part of most students to become acquainted with such writings. Armed with a list of these books, the student could choose a very interesting outline of reading during the summer vacation.

The undergraduate journal would appear to be the most appropriate medium through which the titles of interesting books of this nature might be exchanged. Several years ago, in these columns, such exchanges were begun. It is with regret that we have observed a diminution in the interest displayed with regard to this valuable service.

Many students and graduates, especially members of the teaching staff, must have read books which possess considerable interest from the medical point of view. We suggest that the titles be submitted to us for publication —so that the student body at large may learn of them—and have a list from which to choose desirable extra-academic reading.

The following are some of the books which have been previously recommended:

"The Eye of Allah," from "Debits and Credits," by Rudyard Kipling—(Prof. J. P. McM.)

"In the South Seas," by Robert L. Stevenson—(W. S. K.)

"Rest and Pain," by Hilton—(Dr. H.. B. Van W.)

"The Corner of Harley Street," by H. H. Bashford—(Dr. W. F. McP.)

"An Epistle," by Robert Browning—(Prof. J. P. McM.)

"A Doctor of the Old School," by Ian MacLaren—(W. S. K.)

"Rab and His Friends," by Dr. John Brown of Edinburgh—(Prof. A. H.)

DAFFYDIL. — The thirty-third annual regeneration of Daffydil will take place at Hart House Theatre on the evenings of March 6 and 7. The committee are putting forth every effort to provide a real show for all who turn out on this distinctively Medical occasion. The various years have been rehearsing their skits for the past fortnight and they make for a well-balanced whole, full of ideas original, familiar, and fantastic.

The committee have been fortunate in again securing the services of Mr. Edgar Stone, director of Hart House Theatre, as professional coach. Epitaxis promises to be one of the best yet, which, considering its long and excellent record, is saying something. Due to the smaller accommodation of the Theatre, compared to Convocation Hall, tickets will be sold only to graduates and students in Medicine, after which any remaining will be sold to other faculties. Watch for announcement of ticket sale.

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